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Nina Urala

Functional foods in Finland

Consumers' views, attitudes and willingness to use

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VTT Biotechnology

ACADEMIC DISSERTATION

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Abstract

New kinds of foods, so-called *functional foods*, have been developed and launched in recent years. They provide a novel approach to the idea of healthy eating by linking a single component with a certain health benefit in a single product. However, comprehensive knowledge on the dimensions behind the acceptance of functional foods is lacking and there is no clear understanding of the consumer's perceptions of single functional foods. In addition, it is not known how the dimensions describing functional foods in consumers' minds could explain consumers' willingness to use such foods.

The general aim of this study was to investigate how functional foods are perceived in Finland, what kinds of dimensions underlie the acceptance of functional foods among Finns and could these dimensions be used as a tool in explaining consumers' willingness to use such foods. Seven data sets involving 4536 Finnish participants were included in this study between 1999 and 2004.

As the health effects attached to food products cannot be perceived directly from the product itself, they have to be communicated to consumers. Usually, so-called health-related claims are used. The perception of different types of health-related claims, varying in their intensities, was studied by a survey (n = 958) in which respondents evaluated the perceived disadvantages/advantages of eight health-related claims. All claims were seen as advantages regardless the intensity level of the claim. Women and respondents who trusted the sources of food information reacted more positively towards the claims than men and non-trusting respondents, respectively. However, none of these groups viewed the claims negatively.

Next, the reasons behind choosing or not choosing six functional foods were studied by laddering interviews (n = 50). The functional food products were not

seen as one homogenous food category: the reasons for choosing functional foods varied within different food categories and the functional food choices in one product category did not correlate with choosing a functional food alternative in other categories. However, they were clearly seen as a member of the primary product group (yoghurts, for instance) and as a functional alternative for the conventional products in that particular category. The belief structures found in the hierarchical value maps were used as a basis of functional food-related statements that were monitored in three surveys representing the Finnish population (n = 1158, n = 1156 and n = 1113).

Four dimensions describing the functional food-related attitudes were found: *Reward* from using functional foods (FF REW, 8 items), *Necessity* for functional foods (FF NEC, 8 items), *Confidence* in functional foods (FF CON, 4 items) and *Safety* of functional foods (FF SAF, 5 items). The attitudes towards functional foods had different weight depending on the functional food product, supporting the finding that the functional foods are not seen as a homogenous group. The perceived reward from using functional foods was evidently the best predictor of reported willingness to use such food products. The rewarding feeling was linked with personal use of functional foods, describing how the improved performance and mood, disease prevention and healthy lifestyle derived from the use of functional foods are perceived. Necessity focused on the necessity of functional foods as a concept and it was considered from society's perspective. The confidence in functional foods included trust in the science behind the health benefits and in the health effects that functional foods provide. The safety focused on the possible risks when functional foods are used. In functional food attitudes, there were no differences between men and women, nor were there differences based on respondents' age or education.

In addition, the roles of hedonic liking and the perceived healthiness of functional foods were examined in two choice experiments (n = 41 and n = 60). Actual and expected hedonic liking clearly influenced the functional food choices, but the role of participants' background attitudes remained unclear. The functional foods were seen more as foods than as medicines.

Functional foods seem to approach the status of conventionally healthy foods in Finland. This means that their benefits may become standard options of healthiness.

Academic dissertation

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Espoo, November 2005

Nina Urala

List of original publications

The present thesis is based on the following publications (I–V), which will be referred to in the text by Roman numerals (I–V):

I Urala, N., Arvola, A. & Lähteenmäki, L. 2003. Strength of health-related claims and their perceived advantage. *International Journal of Food Science and Technology* 38: 815–826.

II Urala, N. & Lähteenmäki, L. 2003. Reasons behind consumers' functional food choices. *Nutrition & Food Science* 33: 148–158.

III Urala, N. & Lähteenmäki, L. 2004. Attitudes behind consumers' willingness to use functional foods. *Food Quality and Preference* 15: 793–803.

IV Urala, N. & Lähteenmäki, L. Consumers' changing attitudes towards functional foods. *Food Quality and Preference*. In press.

V Urala, N. & Lähteenmäki, L. Hedonic ratings and perceived healthiness in experimental functional food choices. Revised manuscript.

Research input and authorship of publications (I–V)

The present thesis is a summary of the research reported in the five (I–V) appended articles. The research input and authorship of the articles is as follows:

I Urala, N., Arvola, A. & Lähteenmäki, L. 2003. Strength of health-related claims and their perceived advantage. *International Journal of Food Science and Technology* 38: 815–826.

The planning and the data collection were carried out by Anne Arvola M.Sc. and Dr. Liisa Lähteenmäki. The data analysis and preparation of the manuscript were carried out by Nina Urala M.Sc. The study was supervised by Dr. Lähteenmäki. Anne Arvola and Dr. Lähteenmäki also participated in writing the manuscript by providing comments and suggestions.

II Urala, N. & Lähteenmäki, L. 2003. Reasons behind consumers' functional food choices. *Nutrition & Food Science* 33: 148–158.

The planning of this study was carried out by Nina Urala M.Sc. and Dr. Liisa Lähteenmäki. The data collection and analysis and preparation of the manuscript were also carried out by Nina Urala M.Sc. The study was supervised by Dr. Lähteenmäki and she also participated in writing the manuscript by offering comments and suggestions.

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IV Urala, N. & Lähteenmäki, L. Consumers' changing attitudes towards functional foods. *Food Quality and Preference*. In press.

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V Urala, N. & Lähteenmäki, L. Hedonic ratings and perceived healthiness in experimental functional food choices. Revised manuscript.

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Contents

Appendix 5: Publications I–V of this publication are not included in the PDF version. Please order the printed version to get the complete publication (http://www.vtt.fi/inf/pdf/)

Introduction

Traditionally, the healthiness of food has been linked to a nutritionally healthy diet recommended by nutrition specialists and the role of diet as a whole has been emphasised instead of emphasising individual food items. Lately, new kinds of foods, so-called *functional foods*, have been developed and launched. They provide a novel approach to the idea of healthy eating by linking a single component with a certain health effect in a single product (Lähteenmäki, 2003).

There is no unanimous definition for functional foods. In this study, the term "*functional food*" includes single products that are marketed with health-related claims referring to a specific health effect. The nutritionally modified products (e.g. low-fat and low-salt products) that are regarded as contributors of a healthy diet as defined by nutrition experts belong to the so-called "*conventionally healthy foods"*.

As the health effects cannot be perceived directly from the product itself, they have to be communicated. Healthiness is a credence product attribute that cannot be perceived by using the product (Nelson, 1970; Mixon, 1995; Oude Ophuis & van Trijp, 1995). Earlier studies clearly show that confidence-related aspects strongly underlie the acceptance of functional foods (e.g. Poulsen, 1999; Verbeke, 2005). Achieving a balance between gaining the attention and trust of the consumer (Lähteenmäki, 2004) and adhering to the national regulations concerning the health-related claims in foods may be a real challenge to functional food manufacturers and marketers. In the EU, two types of claims can be made: generic and product specific. Little is, however, known about how consumers perceive the different types of health-related claims and how the different intensity levels of information affect the perceived disadvantageousness/advantageousness of the claim.

It has been shown that innovativeness (Saher et al., 2004, Huotilainen et al., in press), unnaturalness (Poulsen, 1999) and medicine-like status (Frewer et al., 2003) are associated with functional foods (see also von Alvensleben, 2001). Preliminarily evidence (Tuorila & Cardello, 2002) also suggests that the general health interest, which interrelates with traditionally healthy food choices (Roininen et al., 1999), would not predict respondents' interest in functional food products. This assumption needs further investigation as there is a lack of

comprehensive knowledge on the dimensions underlying the acceptance of functional foods and tools for measuring them.

So far, the story of functional foods has been succelsful: functional food markets are increasing and new products are launched regularly (Gray et al., 2003). In everyday discussions – and usually also in academic research – functional foods are treated as one homogenous group. However, it seems that there are considerable differences between products (Bech-Larsen & Grunert, 2003; de Jong et al., 2003; Niva et al., 2004; Lähteenmäki et al., manuscript in preparation) and health effects (Tuorila & Cardello, 2002; van Kleef at al., 2005) how the functional food products are accepted. It is not clear if functional foods form one homogenous group in consumers' minds or whether they are perceived more as products with different positions.

This study was part of a joint project in which the aim was to develop methods for translating consumer expectations into the language of product development and marketing in the food industry. Neither price- nor purchasing-related aspects were considered in the present study because they were investigated in a separate part of this research project (Ollila et al., 2003). In addition, the novelty aspect of functional foods was dealt with rather lightly as it was investigated in detail in the work of Huotilainen (2005).

The general aim of this study was to investigate how functional foods are perceived in Finland, what kinds of dimensions underlie the acceptance of functional foods among Finns and could these dimensions be used as a tool in explaining consumers' willingness to use such foods. The literature review summarises the earlier studies concerning the acceptance of functional foods. Also, the concept of functional foods is described.

1. Literature review

1.1 The concept of functional foods

Conventionally, food healthiness has been associated with nutritional factors such as fat, fibre, salt and vitamin content. In addition to this conventional or traditional healthiness, food may contain single components that may have a positive impact on our well-being (Lähteenmäki, 2003). Products that are claimed to have special beneficial physiological effects in the body have been called "nutraceuticals", "pharma foods", "designer foods", "nutritional foods", "medical foods" or "super foods" (Childs & Poryzees, 1998). More usually they are termed *functional foods*.

The first functional food products were launched in Japan where a food category called FOSHU (Foods for Specific Health Use) was established in 1991 to reduce the increasing health-care costs. To receive FOSHU status, the evidence of the health or physiological effect in the final product has to be scientifically proven. In addition, the FOSHU product has to be in the form of an ordinary food and not supplements. So far, Japan is the only nation that has specific legislation covering functional foods.

Though an official definition of functional foods is lacking in both the US (ADA Reports, 2004) and Europe (ILSI Europe, 2002), the influence of the Japanese legislation on EU and US views of functional foods is apparent. According to an EU concerted action project FUFOSE (Functional Food Science in Europe) coordinated by ILSI (International Life Sciences Institute),

> *"a food can be regarded as functional if it has been satisfactorily demonstrated to affect beneficially one or more target functions in the body beyond adequate nutritional effects in a way that is relevant to either an improved state of health and well-being and/or a reduction of risk of disease".*

Besides providing scientifically proven health effects, functional foods have to maintain a food-like nature and they have to be easily incorporated into the daily diet:

> *"a functional food must remain food and it must demonstrate its effects in amounts that can normally be expected to be consumed in the diet: it is not a pill or a capsule, but part of the normal food pattern" (Diplock et al., 1999; ILSI Europe, 2002).*

Due to the inconsistence of an internationally accepted definition of functional foods it is very challenging to access reliable numbers describing the world-wide functional food markets. However, the concept of functional foods seems to be attractive and consumers have accepted these kinds of health-tailored food products. For instance, in 1998, Childs and Poryzees (1998) reported that 42% of Americans were interested in regularly buying foods that can help prevent disease (n = 1005) (Childs & Poryzees, 1998). De Jong et al. (2003) reported that 52% of their respondents (n = 1183, Dutch) agreed with the statement that development of functional foods was a positive trend.

1.2 EU regulation and self-regulation of health-related claims

From the consumer's point of view, the absence or existence of functional food legislation may not have a very crucial role in food choices as such. For instance in the Netherlands 4% of the respondents (n = 1183) wanted the consumer organisations to lobby for better legislation for functional foods (de Jong et al., 2003).

The consumer's reasoning behind understanding the health-related information is different to the scientist's understanding of science-based information (Lähteenmäki, 2004). In turn, for authorities, marketers and manufacturers, the generally accepted guidelines would clearly facilitate the marketing efforts.

The real challenge for functional food manufacturers is how to communicate the health effects unambiguously and reliably to the consumers. The lack of internationally accepted regulations for communicating the health effects of functional food products makes the use of international marketing communication challenging and expensive (Oude Ophuis & van Trijp, 1995; Jonas & Beckmann, 1998; Poulsen, 1999; Nicolay, 2003; Vieira, 2003; Cheftel, 2005) as the communication strategy has to be adapted to conform with the local

legislation of each nation separately (Katan & de Roos, 2004; Arvanitoyannis & van Houwelingen-Koukaliaroglou, 2005).

European authorities are working with EU legislation to communicate the health effects of functional food products in a more united and harmonised manner throughout Europe. General guidelines on the use of health-related claims state, that they should not be misleading, and should be communicated clearly, understandably and truthfully (European Commission, 2003). Two types of health-related claims can be used in the EU: generic claims and product-specific claims. In both types, the claim can state either enhanced body function or reduced risk of disease. Generic claims have to be based on a generally accepted diet-disease or diet-health relationship. Product-specific claims, in turn, state that the product itself has certain physiological effects (ILSI Europe, 2002). The approval process, before the use of the health-related claim, differs between the types of claim. In general, the product-specific effects have to be scientifically proven in that particular product before the claim is allowed.

The direction of the forthcoming regulations may be more liberal than earlier. It has been proposed that the manufacturers should only inform the EU authorities on the health-related claim that they are planning to make regarding their product. Hence, any pre-approval process would no longer be needed (European Parliament, 2005).

While the authorities and manufacturers are awaiting legislation, several EU countries have developed their own self-regulations on how the health effects can be communicated (ILSI Europe, 2002; Cheftel, 2005; Arvanitoyannis & van Houwelingen-Koukaliaroglou, 2005). The main discussion has been concerned with how the links between the health component, the health effect and the actual product itself should be communicated truthfully, and how the risk-reducing or disease-preventing claims are allowed.

According to Finnish Food Legislation (National Food Agency Finland, 2002), it is acceptable to mention the reducing risk of a disease in the health-related claims, in addition to the improved health and general well-being, if the statement has been proved by the results of at least two independent scientific studies. It is not permissible to mention the prevention or curing of any disease. Sweden has its own interpretation of the EU consensus, namely the Swedish

Code (Asp & Trossing, 2001; Asp & Bryngelsson, 2004). The Swedish authorities gathered a group of health and food specialists who evaluated the links between special health effects and particular food components. Approval of eight dietary health-related benefits with specific components was published. The UK, in turn, has its own self-regulatory guidelines (The Joint Health Claims Initiative) that do not allow any references to disease (Ruffell, 2003). Also, Belgium, the Netherlands, Spain and Switzerland have their own guidelines for communicating the health benefits of foods (ILSI Europe, 2002).

1.3 Characteristics of functional food development

The markets for functional foods are increasing, new products are being launched continuously and competition is becoming more intense (Menrad, 2003). To survive the competition, a functional food product has to be bought repeatedly. Consumers have, however, more and more choices available to them and thus, a product's capability of differentiation and its attractiveness become extremely important.

The research, development and marketing of functional components and food products have specific characteristics and demands that are different from managing these processes in conventional foods: a new functional product development process needs its own strategy in which the product development and marketing are linked closely together (Biström & Nordström, 2002; Mark-Herbert, 2004).

Compared to conventional food development, the biggest difference in developing functional foods is the need for scientific evidence and, thus, a wide range of different specialists are involved in the process (Fogliano & Vitaglione, 2005). A scientific proof of a health effect needs careful, usually long-term interventions and clinical trials. At the same time, the expected product life cycles have shortened (Moskowitz & Saguy, 2002) and food manufacturers are pressed to update their product portfolios faster than hitherto. This dilemma between long-term academic research and demands for a shorter development process makes the development of functional products an exceptionally risky, expensive and challenging field in the food business.

To reduce the expenses and failures, several consumer-oriented product development models have been proposed for supporting the new development processes (Biemans & Harmsen, 1995; Linnemann et al., 1999; Rudder et al., 2001; Steward-Knox & Mitchell, 2003; Mark-Herbert, 2004). Most of these models concentrate on testing actual product attributes (such as sensory characteristics), while consumer characteristics have been considered less. It is pointless to tailor product characteristics without communicating them to the potential buyers.

One approach to better understand and support the potential success of a functional food is to find the dimensions that underlie the functional foods in consumers' minds. Then the product characteristics and especially the marketing communication can be tailored more precisely to appeal to the potential buyers and less desirable messages can be avoided. The special characteristics of functional food development and consumer acceptance of functional foods are shown in Figure 1 (according to the existing literature).

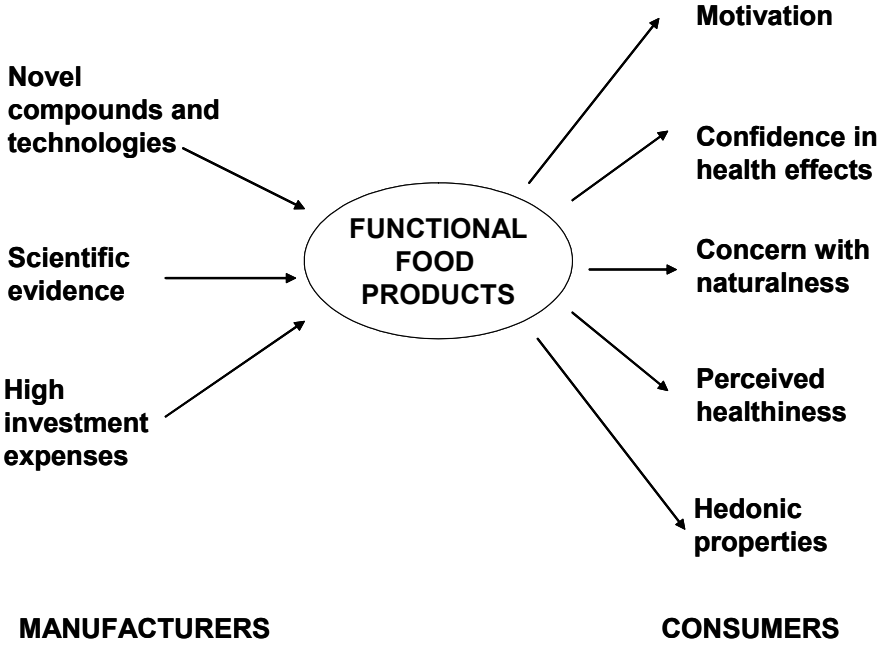


Figure 1. Special characteristics of functional food development (manufacturers) and consumer acceptance of functional food products.

1.4 Acceptance of functional foods

1.4.1 Demographic background

Though the explanatory power of demographic background variables, such as gender, age and education, has been decreasing in explaining food choice behaviour (Dagevos, 2005), their role in functional food acceptance cannot be ignored.

Females tend to have a "virtuous" eating pattern whereas men's eating pattern is more "robust" (Beardsworth et al., 2002). In addition, or perhaps as a result of this, clear gender and age differences between the motives for healthy eating (e.g. Wardle, 1993; Beardsworth et al., 2002; Verbeke, in press), general health interest (Roininen et al., 1999), the perceived healthiness of food descriptions (Oakes & Slotterback, 2001) and the impressions arising from consumers' food shopping lists including functional foods (Saher et al., 2004) have been found. Females have also a greater concern about health conditions compared to men (Bogue & Ryan, 2000; Beardsworth et al., 2002; Noble et al., 2003).

These and numerous other food-related studies, which are not possible to include in this thesis due to the broadness of the topic, suggest that women could comprise a potentially more suitable target group for functional foods than men.

In functional food studies, females have been reported to be more interested in such foods (Childs & Poryzees, 1998; Poulsen, 1999), they have been reported to be more familiar with functional food products (Lähteenmäki et al., manuscript in preparation) and are more frequent functional food users than men (Bogue & Ryan, 2000; Niva et al., 2003). However, it is too simple to conclude that females would be more interested in any particular functional food product as there are clear product-dependent differences between genders (Poulsen, 1999; Niva et al., 2003; de Jong et al. 2003). For instance, in three representative samples of Finns, cholesterol-lowering spread has been reported to have more users among men than women (de Jong et al., 2003; Niva et al., 2003; Lähteenmäki et al., manuscript in preparation).

In general, older people tend to emphasise the disease-preventing effects of foods more than the young. In the focus group interviews of Bhaskaran and Hardley (2002), the health attributes influenced the purchase intent of only one-

fifth of the younger participants (n = 35, Australian). They emphasised taste, quality, price and convenience as the primary factors affecting their functional food buying intent. In comparison, the older participants explained their purchase decisions more with disease preventative reasons such as lowering of cholesterol levels. Functional spread, yoghurt and cereal were used as representatives of functional food products in these interviews.

Bogue and Ryan (2000) reported that older Irish people were more interested in the 'reduces the risk of cancer' type of health-related claim, while the younger participants were more interested in the 'increases energy level' type of claim (total n = 303). In the exploratory study of Tuorila et al. (1998) (n = 44, Finns), the elderly (67–87 years) (n = 19) were more interested in the product labelled high fibre than the younger group (15 years) when the information about a new cereal-based product varied between alternatives (Tuorila et al., 1998). Poulsen (1999) reported that compared to the younger group (under 55-years), the older respondents (over 55 years) reported a higher purchase intention of bread with calcium and vitamins, bread with omega-3, dairy product with fibre, dairy products with calcium and vitamin, and dairy products with omega-3. There were no age-dependent differences in the purchase intention of bread with fibre (n = 205, Danes).

The interest in health effect seems also affect the reported use frequency of functional foods. In the study of de Jong et al. (2004a), the older respondents (45–74 years) were more often users of cholesterol-lowering spread than younger respondents (25–44 years) (total n = 2950, Finns). In addition, the users seemed to be more educated than the non-users. This finding is supported by the results of Anttolainen et al. (2001). When Anttolainen et al. (2001) compared users of plant stanol ester margarines (n = 1095, Finns) to non-users (n = 22 280, Finns) they found that the users tended to be more often older, better educated, married and retried than non-users. In total, 4.6% of Finns used the plant stanol ester margarine as their primary spread. Among middle-aged people (35–44 years) 1% was regarded as users. In turn, in older age groups (64–74 years) the portion of users increased to 9% of the population.

Some exceptional findings have also been reported. In a study of Childs and Poryzees (1998), respondents over 65 years reported a lower purchase interest in a disease-preventing food product (not defined) than respondents under 65 years

(n = 1005, US). Similar result has been showed by Anttolainen et al. (2001) who found that in the oldest age group (75–84 years) (n = 23 375, Finns) 6% used plant stanol ester margarines as their primary spread whereas the portion among 55–74 years Finns varied between 7% and 9%. Perhaps the oldest people simply have practical difficulties in purchasing foods and going to the food stores. They also may think that everything for a lowering risk of cardiovascular disease has already been done.

De Jong et al. (2003) concluded that generalisation of the characteristics of a functional food user is not legitimate: gender, age and education significantly affect the use of the functional food examples but there were clear differences between different functional food products (n = 1183, Dutch) (de Jong et al., 2003).

Verbeke (2005) also stated that the acceptance of functional foods in Belgium (n = 215) was not dependent on socio-demographic characteristics (age, gender, education, presence of children). As in his study, the term "functional foods" was defined according to the definition of Diplock et al. (1999) and no specific product descriptions or example products were attached to the questions, the respondents may have given their opinion about the functional food concept in general rather than referring to a specific functional product. However, his finding supports those of de Jong et al. (2003).

According to the existing literature it can be concluded that gender, age and socio-economic background (or education) is partly connected to the acceptance of single functional foods (de Jong et al., 2003; Lähteenmäki et al., manuscript in preparation). In this study, the interest focuses mainly on the possible differences in functional food-related attitudes between gender, age and educational groups, and the differences in interest in single functional products between these groups will be reported elsewhere (Lähteenmäki et al., manuscript in preparation).

1.4.2 Personal motivation

When Finnish participants (n = 350) were asked to evaluate impressions arising from shopping lists of different persons, clear differences were found between the impressions of buyers of functional foods and those of the buyers of conventionally healthy foods. In general, the functional food buyers were seen to

be more innovative compared to the buyers of similar conventional foods. In addition, they were described as being more unfriendly, unpleasant, suspicious, less loyal and colder persons than those who had conventional foods on their shopping lists (Saher et al., 2004). For some consumers, these social impressions may provide one driver for the first trials of functional products and, thus, act as a part of personal motivation for starting to use a functional product.

However, one could suggest that the most obvious motivation for using functional foods would be improving general well-being, staying healthy or avoiding disease. In general, Europeans (n = 14 331) see healthy eating as one of the most important factors affecting their food choices and they were well aware of their own role in healthy eating (Lappalainen et al., 1998). One-third of European respondents mentioned self-control as the biggest barrier towards healthy food choices and 14% blamed poor knowledge or lack of food choice (Lappalainen et al., 1997).

On average, individuals in industrialised countries see themselves as being more responsible than previously for their own healthiness (Crossley, 2002; Frewer et al., 2003) and they are well aware of the connections between diet and lifestyle-related illnesses (Aarva & Pasanen, 2005; Verbeke, in press). During the health-related focus group discussion of 13 British women, food items and eating were mentioned several times; in addition to smoking, food and eating were regarded as one of the most obvious factors affecting an individual's own state of health (Crossley, 2002). Taking care of one's own health seems to be even a moral issue (Rozin, 1997; Crossley, 2002; Tivadar & Luthar, 2005).

Though people connect food and diet with health, it seems that the motivations for using functional foods have to have personal relevance. General awareness of the linkage between food and health is not a sufficient driver for healthy food choices. Less than 40% of Dutch respondents (n = 1183) thought that using yoghurt with special lactic acid bacteria, cholesterol-lowering margarine, lemonade or sweets with extra vitamins and minerals and foods with extra calcium would be a means of staying healthy (de Jong et al., 2003). In the study of de Jong et al. (2004a), 11% of those with a high cholesterol level reported being a user of cholesterol-lowering spread (n = 9581, of which 2950 reported having high cholesterol levels, Finns). However, cholesterol-lowering drugs were used by 19% of those with a high cholesterol level and 5% of men and 4%

of women used both cholesterol-lowering spread and the drugs (de Jong et al., 2004a). These findings are supported by the results of Anttolainen et al. (2001) (n = 23 375, Finns). These studies clearly show that health problems do not necessarily support the use of relevant functional food.

The personal relevance of the health-related claim clearly predicted the attractiveness, credibility (i.e. how convincing the claim is thought to be) and the willingness to buy functional foods (n = 124, Dutch) (van Kleef et al., 2005). Verbeke (2005) found that the existence of an ill family member increased the acceptance of functional foods (n = 215, Belgians). The evaluations of the role of food in health did not affect the acceptance of functional foods. In the questionnaire, the term "functional foods" was used as an umbrella term representing the concept of functional foods; the acceptance of single functional products was not investigated. Cox et al. (2004), in turn, found that self-efficacy was the most important predictor of intention to consume a functional food that was stated to improve memory (n = 290, Australians).

1.4.3 Confidence in functional foods

Information concerning the health effects and the means of communicating them are the key factors behind the success of the functional food product because the health effect cannot be perceived directly from the product itself. Healthiness is a credence attribute (Nelson, 1970; Mixon, 1995; Oude Ophuis & van Trijp, 1995; Frewer et al., 2003). Health effects may offer the food manufacturers a way of differentiation and promoting new food products with added value (de Boer et al., 2003), but it may be extremely challenging to design credible marketing messages that differentiate one's own product from that of the competitors without providing any advantage to the competing products.

Wansink et al. (2005), showed how the hierarchical levels of knowledge affected the likelihood of consuming soy (n = 606, US). Linking the nutritional product attributes of soy (contains phytochemicals) with the beneficial personal *consequences* (consuming lowers the risk of heart disease) increased the likelihood of consuming soy. Authors showed that the consequence-related claims increased the respondents' consumption intention more than the attribute-level claims.

Tuorila and Cardello (2002) reported that the provided health-related claims can increase the likelihood of consumption of that particular food, but the effect may vary between different health benefits (n = 78, US). In their study, claims that were linked with improved exercise endurance, energy, mental alertness and enhanced memory were most likely to motivate the participants to use a fruit juice on a repeated basis. Improved mood and emotional well-being were considered to be less appealing health effects.

In addition to the means of communicating and the health effect itself, the base (carrier) product guides the acceptance of functional foods. In a conjoint study of Bech-Larsen and Grunert (2003), the perceived healthiness of different food profiles was evaluated in Denmark, Finland and the United States (total n = 1533, exact sample sizes per country were not reported). Three base products (juice, yoghurt and spread) were linked with three types of health-related claims (physiological claim, prevention claim and no claim) and two price levels. In each country, the health-related claims increased the perceived healthiness of the functional foods. However, the base product had a strong effect on how the health component influenced the perceived healthiness: enriched spread was perceived positively and both the enriched juice and yoghurt were perceived negatively from the healthiness point of view (Bech-Larsen & Grunert, 2003).

Consumers seem to be neutral or rather confident in the information concerning specific health effects, and the health-related claims encourage even less trusting consumers to accept functional food products. In the USA, Childs and Poryzees (1998) reported that half of Americans (55%) believed that naturally occurring substances found in fruits, vegetables and cereal grains can help prevent disease. Only 10% of the respondents (n = 1005) were sceptical. Irish people (n = 303) were cautiously positive (average 6.35 on a 1–10 scale) when they were asked how credible they considered the product labels and health-related claims attached to food products (Bogue & Ryan, 2000).

In a qualitative study, Bhaskaran and Hardley (2002) reported that although a large majority (exact numbers were not reported) of their respondents (n = 35, Australian) in a focus group study did not trust the manufacturers' health-related claims, the participants wanted to believe these claims and the health-related claims encouraged them to buy the functional food products. However, the participants also suggested that they would trust the claims more if independent

sources had verified the health-related claims. The most trusted sources for health-related information were doctors, dieticians, educational institutions, family members, Weight Watchers and the Internet.

Jonas and Beckmann (1998) stated, according to their laddering study, that the Danish (n = 20) were more doubtful and reluctant about functional food products (functional yoghurt, juice and butter) than the English (n = 20) (functional yoghurt, butter and breakfast cereals). The Danish were found to have rather little knowledge about functional foods and when probing the links between the values and product attributes in the laddering interviews, they did not link the functional foods or the health effects with upper-level values as often as English respondents did. The English, in turn, considered functional foods as a convenient way to meet the requirements of healthy eating.

Niva et al. (2003) reported that 39% of Finns (n = 1210) trusted in functional food as a concept, 29% were regarded as unconcerned and 32% were clearly doubtful about it. When the respondents were clustered according to their confidence level, clear differences between the use frequencies of four example products (xylitol-sweetened chewing gum, cholesterol-lowering spread, probiotic dairy products and oat bran with added β-glucan) were observed: there were larger numbers of frequent users among the trustful and unconcerned respondents than among the doubtful respondents (Niva et al., 2003). Niva et al. (2003) found that the trust in functional foods guided the reported use frequencies of cholesterol-lowering spreads more than, for instance, age groups alone: in the over 60 years respondent group, almost 40% of the trustful respondents (total n = 1209, Finns) reported frequent use of cholesterol-lowering spread whereas among the doubtful respondents the share of frequent users was 10%.

Verbeke (2005) reported that the belief (n = 215, Belgians) in the health effects of functional foods positively influenced the acceptance of such foods, and the independent information sources were considered as being the most trusted. However, the knowledge and awareness of the concept negatively affected the acceptance of such foods.

De Jong et al. (2003) reported that the Dutch (n = 1183) were not confident about the efficacy of four functional food examples. For instance, 16% of the respondents agreed that the efficacy of cholesterol-lowering spread has been

proven sufficiently. Foods with added calcium were believed to have the greatest efficacy, with a share of 35% of trusting respondents. Respondents reported low use frequencies for the example products. In another study of de Jong et al. (2004b), it was reported that 84% of the Dutch dieticians (n = 238) thought that the health-related claims attached to functional food products can be misleading for consumers. Dieticians had also doubts concerning the safety aspects and efficacy of functional foods. However, most of the dieticians had positive attitudes towards functional foods and advised their clients about functional food use.

1.4.4 Concern with naturalness

The manufacture of functional foods often requires modern food technology since a constituent needs to be added, removed or modified. This means that there is a risk that functional products are perceived as being less natural than conventional products and are thus avoided by those who value naturalness in food choices (Frewer et al., 2003). Rozin et al. (2004) showed that people's (n = 166 and n = 144, US) preference for natural products is substantial, especially regarding foods, and healthiness perception was highly dependent on how the naturalness of the product is perceived. Naturalness was most preferred in raw foods and decreased for processed foods and non-food products such as skin cream, shampoo, mouthwash and medicines. Both the healthiness and effectiveness evaluations followed the same pattern, indicating that perceived healthiness and effectiveness were strongly linked with natural preference in foods.

The relation between functional foods and drugs may be unclear for consumers. In the study of Jonas and Beckmann (1998), the fortification and modification of functional food products particularly bothered the Danes (n = 20): they considered fortification "unnatural and impure". In turn, they regarded pills and supplements as acceptable resources for balancing their nutritional needs. Functional foods were perceived as being more natural than genetically modified foods, but less natural than conventional or organic food (Jonas & Beckman, 1998). Also, Cox et al. (2004) found that when evaluating the intention to buy functional foods linked with a) a bitter taste of the active constituents, b) an artificial sweetener suppressing the bitterness of the active constituents, and c) double effectiveness of the product due to genetic modification, the product

linked with genetic modification was rated lowest (n = 290, Australians), indicating the undesirable combination of high technology and functional foods.

However, according to the study of de Jong et al. (2003), the Dutch (n = 1183) considered functional foods (four example products) as being clearly more like foods than drugs. The least medicine-like examples were foods with extra calcium and yoghurt with special lactic acid bacteria. The perceived naturalness was not linked directly with the evaluations of medicine likeness. Though the respondents disagreed with the statement that lemonade or sweets with extra vitamins and minerals would be considered to be natural, these products were not seen as drugs. The naturalness associated with functional foods may be more dependent on how appropriate the health effect is to the base product (Poulsen, 1999) than the health effects as such.

Similar results have been reported also among the Finnish. According to focus group discussions considering novelty in foods, Finnish contributors (n = 44) thought that technology should not be associated with food (Bäckström et al., 2003). Both genetically modified foods and functional foods were seen as being unnatural. Among other example products representing novelty in foods, a functional fruit drink was used as a stimulus representing functional foods. The functional foods were connected with surprisingly powerful metaphors such as 'medicine', 'explosions' and 'nuclear power'. However, when the dimensions describing novelty in foods were used for predicting willingness to try different types of new foods, the adherence to natural and the adherence to technology both had a positive effect on the respondents' reported willingness to try modified milk products (functional yoghurts, fat-free yoghurts, functional ice cream and calcium-fortified milk) (n = 743, Finns) (Bäckström et al., 2004). Despite the target products not including purely functional products, the result shows that the doubts about functional foods found in focus groups did not appear in the survey.

1.4.5 Hedonic perception

The hedonic properties of food are certainly the main drivers behind human food choices (Bolles, 1991). In functional foods, there is a real risk that applying new technologies and compounds to foods negatively affects the taste and other

sensory characteristics (Tuorila & Cardello, 2002; Lyly et al., 2003; Lyly et al., 2004; Luckow & Delahunty, 2004a; Luckow & Delahunty, 2004b) and consumers tend to have real doubts concerning the impaired taste of these foods (Jonas & Beckmann, 1998; Bäckström et al., 2003; Verbeke, in press). Fogliano & Vitaglione (2005) present three strategies that are typically applied in developing new functional foods: 1) modifying the raw material (for instance adding omega-3-fatty acids to hens' diet to achieve omega-3-enriched eggs), 2) modifying the technological process (for instance fermentation of extrusion) or 3) modifying the recipe (for instance adding probiotics). All these technologies have potential to influence the hedonic characteristic of the product.

For instance, β-glucan was found to influence the sensory thickness of orange juice (Lyly et al., 2004) and soup (Lyly et al., 2004), a juice drink containing a probiotic culture has been reported to have off-flavours (such as "sour") (Luckow & Delahunty, 2004a) and functional orange juice has been described as having "artificial" and "medicinal" flavours (Luckow & Delahunty, 2004b).

It is obvious that there is no reason for bad-tasting functional foods. The health-related information may influence the acceptance of the functional food, but not the hedonic evaluations (Stein et al., 2003) and medicine-like flavour does not support the perception of health benefit (Tuorila & Cardello, 2002). Stein et al. (2003) found that participants who were given information about the health effects of an unfamiliar beverage chose more bottles as a reward after the experiment compared to the group who did not receive the information. However, the information did not affect the hedonic ratings (Stein et al., 2003). Tuorila and Cardello (2002) reported that a slightly bitter off-flavour from added KCl did not support the perceived health benefit of US participants (n = 78) (Tuorila & Cardello, 2002). Neither the majority of women nor men has been willing to use functional foods that have a worse taste than their conventional counterparts (Verbeke 2005; Verbeke, in press). Verbeke (2005) reported that over 50% of the respondents stated that they would not readily compromise the taste of a food even if the food was functional.

However, there may be a small group of respondents who could be willing to use functional foods that taste worse than their conventional counterparts (Verbeke, in press), but it is clear that worse-tasting functional food products is not a very successful strategy for the manufacturers. The health benefits clearly increase

the acceptance of functional foods maybe by increasing the perceived healthiness (Bech-Larsen & Grunert, 2003), but, in the end, the hedonic characteristics are certainly one of the main drivers affecting functional food acceptance (Tuorila & Cardello, 2002; Bower et al., 2003; Moskowitz et al., 2004; Huotilainen et al., in press) that cannot be overlooked. Huotilainen et al. (in press) showed that the liking ratings of new functional drinks were the strongest predictors of the preferred use frequencies. Bower et al. (2003) reported that Scottish people's (n = 70) purchase intent of spreads labelled with a proven health effect was strongly related to the degree of liking, in addition to the health label.

These findings clearly indicate that functional food products are expected to have excellent hedonic properties providing taste-driven hedonic pleasure (Bolles, 1991). Both the degree of hedonic liking and the health effect seem to have a positive influence on functional food acceptance, though the liking and perceived healthiness have previously represented contrary dimensions in food choice (Tepper & Trail, 1998).

1.5 Attitudes in explaining functional food acceptance

Human food choice behaviour is challenging to explain. It is a multidimensional social process in which the product-, individual- and environment-related factors affect the behaviour (e.g. Shepherd & Sparks, 1994). Food and eating have numerous cultural, social and individual connotations, and eating is viewed more diversely than as only a necessity for survival. It is highly dependent on the social context (Meiselman et al., 2000), other people (Rozin, 1990) and individual psychological factors such as mood (Macht, 1999; Patel & Schlundt, 2001). Food does not just imply energy and nutrients (Rozin, 1996). In addition, food choice behaviour has become one way of expressing one's own identity (Lindeman & Stark, 1999; Saher et al., 2004; Tivadar & Luthar, 2005). Human food choice behaviour cannot be investigated in laboratories (Meiselman, 1992).

Consumers make several minor decisions considering their food choices every day and spontaneously explain their behaviour as being habitual (Ernst & Epstein, 2002; Lindbladh & Lyttkens, 2002), but the hidden reasons behind the choices often remain unclear, even for the individuals themselves. One way of

predicting consumer behaviour is by measuring their attitudes (Shepherd & Sparks, 1994), as attitudes have been shown to explain individuals' behaviour intention (Ajzen & Fishbein, 1980).

Attitudes have several definitions (Haddock, 2004) and in this thesis the definition of Eagly & Chaiken (1993) has been used: "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly & Chaiken, 1993). The conflicts between the actual behaviour and the attitudes are actively avoided and the possible behaviour options are reduced to those that fit the attitudes best. By measuring attitudes towards the action, the behaviour (in this thesis, functional food choice) may be predicted (Ajzen & Fisbein, 1980).

Attitudes have been found to affect food choice behaviour and they provide a useful tool for explaining food choices (Shepherd & Sparks, 1994; Tuorila, 1997; Poulsen, 1999). Numerous papers describe attitude measurements for predicting eating and food choice behaviour (e.g. Steptoe et al., 1995; Lähteenmäki & Tuorila, 1994; Kähkönen et al., 1997; Roininen et al., 1999). These measurements are not described in detail within this thesis, but some interesting points are highlighted here. For instance, Shepherd et al. (1991) found no effect on the liking or purchase intention ratings of a milk drink when the respondents (n = 80, UK) were given fat-related information. However, when the respondents were divided into subgroups according to their attitudes towards fat, statistically significant differences in both liking and purchasing intention were observed. Roininen & Tuorila (1999) found that general health interest explained choices between two snacks having different health images (an apple and a chocolate bar) (n = 174, Finns). In a study of Poulsen (1999), the respondents' (n = 205, Danish) attitudes towards the buying intention of functional foods explained almost wholly their purchasing intentions.

Attitude measurements likely provide a suitable tool also for predicting consumer acceptance of functional foods. However, there is lack of published attitude measurements that would be targeted directly to functional foods. Generally, it is unclear should there be measurements developed especially for functional foods or could the existing attitude measurements successfully predict the choices of functional foods as well. Published knowledge on the attitude measurements that could capture the special characteristics of functional foods

(Fig. 1) is weak. According to existing literature, the general health interest could have influence on the choices of functional foods (Roininen et al. 1999), however, there is no proof for that (Tuorila & Cardello, 2002). Natural product interest may have influence on the functional food choices as the functional foods have considered being unnatural (Jonas & Beckmann, 1998; Bäckström et al., 2003). Food neophobia scale (Pliner & Hobden, 1992) could capture at least partly, the novelty aspect of the functional foods.

Though the attitude measurements could be a successful tool for predicting consumers' functional food choice behaviour (Tuorila, 1997), there is still indistinctness how the attitudes related to functional foods choices could be measured and how these attitudes are related to consumers' functional food acceptance.

2. Aim of the study

2.1 Overall aim

The overall aim of this study was to investigate how functional foods are perceived in Finland, what kinds of dimensions underlie the acceptance of functional foods among Finns and could these dimensions be used as a tool in explaining consumers' willingness to use such foods. This overall aim was achieved by seven sub-aims.

2.2 Sub-aims

1. To investigate how consumers perceive health-related claims that vary in their intensities (Publication I). This sub-aim supported the overall aim by providing information on how Finns' perceive different types of health-related claims and health components and what are Finns' general attitudes (positive/negative) towards health-related claims. This knowledge was needed to better understand the basis of Finns' functional food acceptance as the confidence in health benefits seem to be extremely crucial in functional food acceptance.

2. To find underlying belief-structures and values that can explain Finns' willingness to use functional foods (Publication II). This sub-aim supported the overall aim by providing new information on what kinds of views lie behind Finns' functional food choices. The knowledge was needed for creating the basis for the functional food -related measurements that were used for further investigations of Finns' functional food -related attitudes.

3. To investigate whether the functional foods form a homogenous group of products (Publications II, III, IV). This sub-aim supported the overall aim by providing information on how the dimensions influencing Finns' acceptance of functional foods are implemented in single functional food products. Are they equally important for the acceptance of all functional food products or are there differences between single functional food products in how the dimensions are emphasised.

4. To explain Finns' reported willingness to use functional and conventional food products (with positive health image) by using their functional food -related attitudes and relevant existing attitude measurements (Publications III, IV). This sub-aim supported the overall aim by focusing on how the functional food -related attitudes explain Finns' willingness to use functional foods, are these attitudes relevant in the reported interest in functional foods, do the attitude measurement capture purely the functional foods and what is the relationship between the functional food -related attitude measurements and existing attitude measurements. This information was needed to understand how the acceptance of functional foods can be explained with the dimensions that were found and used as feasible attitude measurements.

5. To study the roles of gender, age and education in the perception of health-related claims (Publication I) and in the attitudes towards functional foods (Publications III, IV). This sub-aim supported the overall aim by studying if these commonly used demographic groups differ in their attitudes towards health-related claims and functional foods. This information was needed to understand how men and women and different age and educational groups differ in their attitudes towards functional foods. If large differences are found, these differences should take into account when using the functional food -related attitude measurements.

6. To monitor the basis of the functional food attitudes between 2001 and 2004 (Publications III, IV). This sub-aim supported the overall aim by focusing on how the attitudes are developing as from the consumers' point of view the field of functional foods has been dynamic. This approach was also needed for developing the measurements into feasible form and for checking the factorial structure of the attitude items. The information was needed to understand how the dimensions that were found in the first survey existed in coming years.

7. To study the roles of hedonic liking, perceived healthiness and the background attitudes in repeated choices of functional and conventional food products (Publication V). This sub-aim supported the overall aim by focusing on the roles of hedonic liking, perceived healthiness and the background attitudes in functional and conventional food choices in experimental choice tasks. This information was needed to understand what

are the relationships between the choices of functional products and given liking and healthiness evaluations and how strong is the link between the choices of functional products and functional food -related attitude measurements (developed in the present study) and on the other hand the choices of conventional food products (with positive health image) and the relevant existing attitude measurements.

The aims, methods and participants are described in more detailed in Appendix 1. See also the original publications in Appendix 5.

2.3 Means to achieve the sub-aims

1. As the information is the key factor in making a food product functional, the health-related claims were chosen as the basis of the current study. In addition, food industry was interested in how the consumers perceive the health-related claims attached to food products. There was no existing knowledge on how the health-related claims in different intensity levels would be perceived by Finnish. This sub-aim was in focus in the first survey (I) and it was achieved by investigating how the health-related claims that vary in their intensities are perceived in Finland and how the respondents' trust in food-related information and the familiarity of the health component influence the perceived disadvantageousness/advantageousness of the claims.

2. To find underlying belief-structures and values that can explain willingness to use functional foods, a qualitative study was implemented. This sub-aim was achieved by searching belief-structures and values behind the choices of functional foods and it was carried out by investigating given reasons (product attributes, consequences and values) for choosing or not choosing functional food products belonging to different food categories (II).

3. To investigate whether the functional foods form a homogenous group of products, consumers' views towards single functional food products belonging to different food categories with different types of health effects were investigated. This aspect was focused upon because there were no comprehensive studies on how single products belonging to the concept of

functional foods are perceived. This sub-aim was in focus both in a qualitative study where the choice reasons behind six different functional food categories were compared (II) and in three surveys (III, IV) where the influence of participants' attitudes on the willingness to use functional foods were compared between single functional food alternatives.

4. The dimensions found in the qualitative section were quantified and three large surveys with representative sample of Finns were implemented (III, IV). Finns' reported willingness to use several functional and conventional food products (with positive health image) were explained by using respondents' functional food -related attitudes. Relevant existing attitude measurements were used for studying what is the value of the developed functional food -related attitude measurements in predicting the interest in single functional food products. If the existing scales explain the interest in functional foods equally well or better than novel functional food -related measurements, the value of the novel measurements would be minor. On the other hand, if the novel measurements explain the interest in functional foods better than existing attitude measurements, they would offer a novel tool for both academic and marketing research.

5. To study the roles of gender, age and education in the perception of health-related claims and in the attitudes towards functional foods these demographics were used as background variables throughout the study (I, III, IV). The sub-aim was achieved by investigating the roles of gender, age and education in perceiving the advantageousness of the health-related claims (I). Also, possible differences in the functional food -related attitudes were studied (III, IV).

6. To monitor the basis of the functional food -related attitudes the attitudes towards functional foods were monitored in three surveys (III, IV) over a period of 27 months.

7. To study the roles of hedonic liking, perceived healthiness and the background attitudes in repeated choices of functional and conventional food products, two choice experiments with real food products were carried out. This sub-aim was achieved by monitoring repeated functional, organic and conventional food choices and the roles of hedonic liking, perceived

healthiness and functional food attitudes in the choices were focused upon. Existing attitude scales were used for comparing the existing and novel functional food -related attitude measurements.

3. Materials and methods

3.1 Participants and sampling

To investigate how consumers perceive specific health-related claims that vary in their intensities (I), participants (n = 958) were recruited from lunch cafeterias all over Finland with the help of a catering company. The convenience sampling method was used because the aim did not focus on Finnish population as whole. The sample was not targeted to represent the entire Finnish population as places of work were used as the recruiting source. However, different age and education groups, men and women, and the place of living were well represented (Statistics Finland, 2005; Finland essentials, 2005). The data were collected in spring 1999.

To find underlying belief-structures and values that can explain willingness to use functional foods (II), the interviewees (n = 50) were recruited from a daytime ferry using the convenience sampling method. The participants were not targeted to any special consumer group as interviewees were considered as a starting point of wider investigations. The data were collected in August 2001.

To explain Finns' reported willingness to use functional and conventional food products (with positive health image) by using their functional food -related attitudes and relevant existing attitude measurements (III, IV), it was necessary to use representative samples of Finns. Hence, the respondents (n = 1158; 1156 and 1113) were recruited by a nationwide marketing research agency (Taloustutkimus Oy) by random sampling method. Practically, the samples represented the Finnish population (Statistics Finland, 2005; Finland essentials, 2005). The data were collected between December 2001 and March 2004.

To study the roles of hedonic liking, perceived healthiness and the background attitudes in repeated choices of functional and conventional food products (V), the participants (n = 41 and 61) were recruited from VTT (Technical Research Centre of Finland) and two large office blocks located in Espoo using the convenience sampling method. The participants were not targeted to any special consumer group as the focus was on the mechanisms behind repetitive food choices. The data were collected in May 2003 and June 2004.

The participants in all the studies were voluntary Finnish consumers. In all samples, except in investigating the perceptions of health-related claims (I), there were slightly more females than males in the sample. This is a common situation, as the females are usually more co-operative in taking part of studies than men (Fife-Schaw, 2002a). A summary regarding the participants is given in Appendix 1.

The participants were either given a small gift after they had completed the study (I, II, V) or a lottery was arranged among the participants who had returned the completed questionnaire (III, IV).

3.2 Functional food samples

Descriptions of several health components (I) and functional foods (III, IV), photos of commercial functional foods (II) and commercial functional food products (V) were used throughout the study. They were chosen to cover typical and/or potential health components (I) or typical functional foods (II, III, IV, V) in Finland. They also represented different types of health effects and product categories.

In general, products with added fibre, added calcium, added beta-glucan and probiotics represented functional foods that promote general well-being. Cholesterol-lowering spread and blood pressure-lowering milk represented products with a disease-risk-lowering effect and energy drinks represented products relating to improved mental performance. Xylitol-sweetened products represented a familiar food type with a well-known health effect. Xylitol-sweetened chewing gums have been launched in Finland long before (from 1975) (www.xylitol.net) the functional food concept was launched and their caries-preventing health effect is well known among Finns. However, in studying the perceptions of the health-related claims (I), all the health components (fibre, probiotics, calcium, xylitol, sitostanol and conjugated linoleic acid) were related to disorders or disease.

Reference products were chosen to represent conventionally healthy familiar products (mainly low-salt and low-fat products) (I, II, III, IV). Also, a product that (in consumers' minds) has a positive health image without scientific proof

(organic bread) (Zanoli & Naspetti, 2002; Bech-Larsen & Grunert, 2003) was included in the surveys (III, IV).

3.3 Procedures

3.3.1 Perceptions of health-related claims

First, a survey was carried out to investigate how the consumers perceive health-related claims of varying intensity (I). Respondents evaluated the perceived disadvantageousness or advantageousness of eight different health-related claims on a 7-point bipolar scale (–3 = major disadvantage, 0 = neither a disadvantage nor an advantage, and +3 = major advantage). Thus, both negative and positive perceptions of the claims were allowed. In Finnish, there are clear and unambiguous contrary words defining this bipolar scale ("suuri haitta" and "suuri etu").

The claims were linked with six typical or potential functional components: 1) added fibre, 2) probiotics, 3) conjugated linoleic acid (CLA), 4) sitostanol, 5) added calcium, and 6) xylitol. Two claims were added to the questionnaire: a claim linked to conventional healthiness (low-salt) and a novel non-health-related claim (high-pressure technology). Conventional health claim and non-health-related claim were included to the questionnaire because they were generally interesting claims that are used or could be used for labelling foods. All claims varied at four so-called intensity levels: a claim at the mildest level mentioned only the health component. At the second level, a health effect was linked with the component. The third and the fourth levels promised a stronger and more definite effect by linking the risk-lowering or disease-preventing effects, respectively, directly to the product (I: Table 2). Each respondent was presented eight claims, one from each component.

3.3.2 Reasons behind functional food choices

Next, individual laddering interviews were used for exploring the reasons (product attributes, consequences and values) given for choosing or not choosing a functional food product (II).

The laddering method is based on models of cognitive structures describing how the concrete product characteristics are linked to consequences and then to higher values. These structures are called means-end chains (MECs). The laddering technique allows the respondent to use his/her own language and feelings when describing the "goals" behind product choices. The interviews are focused on the individual's own insight of the phenomenon as the respondent is considered to be a specialist of his/her own world (Reynolds & Gutman, 1988; Gengler & Reynolds, 1995; Grunert, 1995; Miles & Rowe, 2004; Costa et al., 2004). Compared to other qualitative methods, such as focus groups (Casey & Krueger, 1994), repertory grid (Gains, 1994) or word association, the laddering technique has been shown to provide clear and more detailed information about consumers' insights (Miles & Rowe, 2004; Costa et al., 2004; Roininen et al., in press). Most importantly, using the laddering technique, it is possible to find higher values that are linked with the consequences and product attributes.

Here, the laddering method was used to achieve a deep understanding of belief structures underlying Finns' functional food choices (and non-choices). A subset of the consequences and values linked with functional food choices were used as a basis of generating functional food-related attitude statements as there was no existing literature for that purpose.

Commercial functional food products available in Finland were screened and six product categories including functional food alternatives (yoghurt, juice, ice cream, spread, carbonated soft drinks and sweets) were chosen to represent different types of health effects. These were general well-being (probiotic yoghurts, juice and ice creams), lowering risk of disease (cholesterol-lowering spreads) and nutritionally improved products (nutritionally enriched carbonated soft drinks). In addition, xylitol sweets represented a familiar food product with a well-known health effect (www.xylitol.net).

The interviews followed the general procedure of the laddering technique (Reynolds & Gutman, 1988; Miles & Rowe, 2004). For attribute elicitation, the sample foods (in each category) were divided into different subgroups according to their assumed health image and photographed; photographs were then laminated as product cards. One card from each category represented the functional alternatives of that particular food category and the other cards represented the conventional counterparts. For instance in yoghurts, the probiotic

yoghurts represented the functional alternative from which all the choices were made. The conventional alternatives were low-fat yoghurts, natural yoghurts and fruit/berry flavour yoghurts (on three separate cards) (II: Table 1).

Using several conventional alternatives, it was possible to cover widely individuals' choice combinations. It was also expected that comparisons between several alternatives would help the interviewees in producing product attributes. The design also provided information about the functional food choices in contrast to different types of conventionally healthy alternatives.

Two trained interviewers (author and a colleague) collected the data. Labelled product cards were shown to the interviewees in pairs (a functional card and one card from the conventional alternatives) and the interviewees were asked to choose the preferred card from each pair. After the choice, the interviewer asked the 'why' questions concerning the reasons for the choice (Reynolds & Gutman, 1988; Miles & Rowe, 2004). The data collection was continued until new interviewees no longer produced any new information about the reasons for choices. The contents of the interviews were analysed and classified by the author, and the classified data were entered into LadderMap software (Gengler & Thomas, 1993) as product attributes, consequences and values.

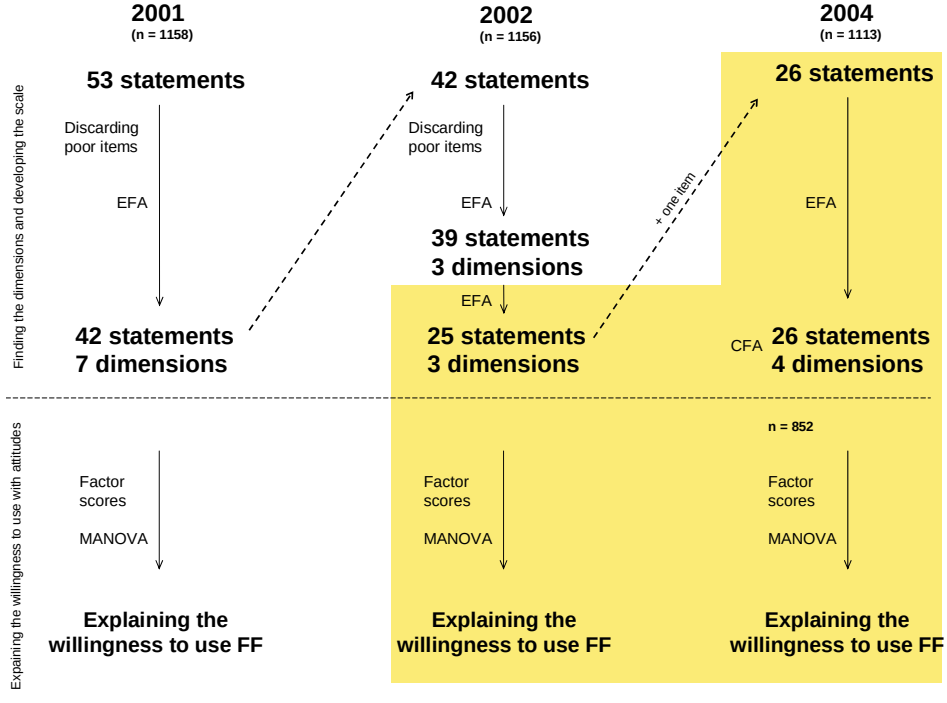
3.3.3 Dimensions underlying functional foods

A hierarchical value map for each product category was produced. The most vital MECs were extracted from the hierarchical value maps and they were used as the basis in generating the functional food-related statements. However, price and novelty-related MECs were not used as these aspects were studied in other parts of the research project. A large pool of both negatively and positively worded functional food-related statements were generated by the author and two colleagues. Statements were generated based on the results of the laddering study and existing literature. Although there were no medicine-related MECs in the hierarchical value maps, several medicine-related statements were formulated and added to the questionnaire based on existing literature (Poulsen, 1999).

Explorative factor analysis (EFA) (Maximum Likelihood, Varimax Rotation) was used to find the dimensions underlying the interest in functional foods (III,

IV). EFA is a statistical method for discovering which variables (in this case statements) form coherent subsets (in this case dimensions representing the attitudes) that would be relatively independent of one another (Beardsworth et al., 1999; Tabachnick & Fidell, 2001). Strongly skewed or poorly loaded items (factor loading 0.3 or less) were discarded and a new analysis excluding these variables was carried out.

The individual factor scores were saved as new variables representing the functional food attitudes and used in explaining the reported interest in functional and conventional food products. Factor structure and the loadings were used for developing a shorter set of statements. Confirmatory factor analysis (CFA) was used in confirming the structures of the short scale. The procedure of the surveys is presented in Figure 2.



FF = Functional foods
EFA = Exploratory factor analysis, CFA = Confirmatory factor analysis
MANOVA = Multivariate analysis of variance

Figure 2. The procedure of the attitude measurements (III, IV). The shaded area represents the measurements that have been compared in this thesis and in Publication IV.

In total, 53 statements were included in the first questionnaire after pre-testing (n = 33, students and personnel from the Helsinki University of Technology). After discarding the skewed and poorly loaded items, 42 statements formed seven factors (III). These were then included in the second survey after minor clarifications on wordings (IV). However, instead of seven dimensions as found in an earlier survey, the statements formed three dimensions. Shorter measurements were constructed by discarding items with a skewed distribution, poor loading or similar content to other items loaded on the same dimension.

After ensuring (exploratory factor analysis) that the remaining 25 statements still formed three dimensions in that data, the items were included in the third survey (2004) (IV). The purpose of the third survey was to monitor whether the dimensions were still changing, because such clear changes were observed between the factorial structures in 2001 and 2002 (from seven dimensions to three dimensions). For the third survey, one item from the first survey was added to strengthen the risk-related aspect of the confidence-dimension as there were three statements referring to the possible risks of functional foods and other four statements clearly presented rather different aspect referring to science and full filling the promises (Fig. 2) (IV: Table 3).

3.3.4 Attitudes in explaining the willingness to use functional foods

In all these three stages, a potential practical tool (scale) for measuring respondent's attitudes towards functional foods was suggested. Double-loaded items were included in the more appropriate factor according to its content. Cronbach's alpha was used for testing the reliability of the scales despite some limitations that have been suggested regarding it (Hattie, 1985; Voss et al., 2000).

The functional food scale based on the factorial structure of the last survey was confirmed with confirmatory factor analysis using Amos 4.0 software (SEM, Maximum likelihood) (Amos 4.0 User's Guide; Rigdon, 1998; Raykov & Marcoulides, 2000). SEM is a statistical method that compares how a defined model fits the covariate matrix of the observed data (Raykov & Marcoulides, 2000).

Typically, the goodness of the model (i.e. how well the model represents the observed data) is evaluated with several indices (Amos 4.0 User's Guide, Raykov & Marcoulides, 2000). Caution must prevail when interpreting the chi-square value in SEM, especially in large samples (Raykov & Marcoulides, 2000; Hammond, 2002). Non-normed fit index (NNFI), root mean square error approximation (RMSEA) and comparative fit index (CFI) are preferred (Raykov & Marcoulides, 2000). In-depth evaluation of the goodness of SEM models is complex and further discussions about the special characteristics and differences between the indices are not included in this thesis.

In the current study, the scales were used as dependent (latent) variables and the statements belonging to each scale were used as the independent (exploratory) variables. Interrelationship between the scales was allowed according to previous analysis (III: Table 4; IV: Table 5). The model was tested in the observed data of the 2002 and 2004 surveys.

MANOVA models (repeated measures) were constructed to study how the dimensions representing the functional food attitudes (factor scores from EFA) explain respondents' reported willingness to use different functional and conventionally healthy foods. MANOVA is a statistical method that tests how the differences (variance) in several dependent variables can be explained with the several independent variables. In this study, the dependent variables were the reported willingness to use -ratings of the functional and conventional food products in the questionnaire (III: Table 3; IV: Table 6). The repeated measurements option was used because it takes account that the responses come from the same individuals (Tabachnick & Fidell, 2001). Instead of using scale means as the independent variables, the factor scores saved from the factor analysis were used. There are several reasons for doing that. Firstly, the factor scores can be used as continuous variables. If the respondents are classified for instance into three or four groups according to their scale means, statistical information may be lost. Secondly, the factor scores take into account the factor structure as whole. In this study it was extremely important as the factor structure was partly ambiguous. Thirdly, the factor scores are standardised.

Willingness to use was evaluated on a 7-point scale (1 = not at all willing, 7 = extremely willing) in each survey. This measurement was chosen as the target variable, because it can be related both to new and familiar foods, and even to

product descriptions, when there is no real product available. It was also assumed that it would offer an unambiguous question for respondents to answer as it related to the respondent's own motivation for using the product instead of evaluating, for instance, the intention to try, use or buy. In evaluating buying intentions, the perception of the possible price and the uncertainty of the availability could influence the responses. It will be uncertain for whom respondent buys the product. Also, the intention-related questions would have needed a time limit to be a precise measurement (for instance "during next month") (Fife-Schaw, 2002b). In addition, willingness to use referred also to more frequent use of the product instead of, for instance, willingness to try.

The target products for the surveys were chosen to represent the most typical commercial functional food products in the Finnish market and three types of health effects: lowering risk of disease (cholesterol-lowering spread and blood pressure-lowering milk drink), improvement in general well-being (probiotic products, products with added-calcium and added-fibre products) and improvement in mental performance (energy drinks). In addition, xylitol sweets represented a familiar food product with a well-known health effect (www.xylitol.net). In the first survey, the selection was wider, but it was decreased for the next surveys as there were some overlapping products in the selection and some of the products had disappeared from the market.

Reference products were included in the surveys to investigate how the functional food-related attitudes are related to the reported willingness to use conventionally healthy products (low-fat and low-salt products) and products with high health image without scientific proof (organic bread) (Zanoli & Naspetti, 2002). Rye bread represented a widely used, traditional Finnish food product with a highly positive health image. This design allowed evaluating the relevance of the developed measurements in explaining especially the willingness to use *functional foods*. If the novel measurements also explain the interest towards conventionally healthy products and/or products with other ways healthy image (organic bread), the measurements cannot be considered as purely functional food specific tools.

In Publications III and IV, three existing attitude scales that were expected to be relevant in explaining the willingness to use functional foods were used in the MANOVA model for comparing functional food-related attitudes and existing

scales. General health interest (GHI) (Roininen at al., 1999), Natural product interest (NPI) (Roininen et al., 1999) and the Food neophobia scale (FNS) (Pliner & Hobden, 1992) were considered to be potential measurements of attitudes towards healthiness, naturalness and novelty in functional foods, respectively (please see section 1.5 in the literature review).

As the healthiness of functional foods may differ from the healthiness of conventionally healthy foods, GHI was expected to explain the interest in functional foods, but only moderately (Tuorila & Cardello, 2002). In addition, GHI was expected to provide information on the relationships between functional and conventionally healthy foods. NPI, in turn, was expected to decrease the willingness to use functional foods, but only if they are regarded as less natural than conventional products (Poulsen, 1999; Bäckström et al., 2003). The FNS measures willingness to taste foods with new sensory characteristics and has successfully predicted the choices of novel ethnic foods. As functional foods should not differ from conventional products in their sensory characteristics and it is not possible to taste the functional foods in the survey, it was expected that FNS would explain the interest in functional foods only weakly, but would provide knowledge on how the food neophobia is related to the interest in functional foods.

3.3.5 Liking and perceived healthiness

The purpose of the last study was to monitor participants' repetitive choices from selections that include functional alternatives (V). Two choice experiments were carried out. In both experiments, four samples were labelled with health-related information and two samples had no health-related information. In the first experiment, there were two types of health-related information on the snack-bar packages: two samples were labelled as an organic product by adding a word "organic" ("luomu" in Finnish), two as a functional product by adding a health-related claim on the package and two had no health-related information (conventional alternatives) (V: Table 2). The organic products represented foods that have a positive health image without a scientific proof (Zanoli & Naspetti, 2002) and the functional products represented healthiness that is connected to a single product with a health effect (Diplock et al., 1999).

In the second experiment, two types of health-related claims were provided on the beverage bottles: two beverages were labelled as functional by a fibre-related health claim referring positive effect on gut well-being and two beverages, also, as functional with a carbohydrate-related claim referring positive effects on blood glucose levels. Again, two products had no health-related information representing conventional alternatives (V: Table 3).

Different health-related claims were used for searching how the background attitudes are associated with the choices of alternatives with "attitude-relevant" information. For instance, organic alternatives were used for checking how the natural product interest would be associated with the choices of organic alternatives. This approach provides information on the capacity of existing attitude measurements in such an experiment in addition to the information on the capacity of the novel functional food -related measurement.

In the first experiment, the participants were allowed to familiarise themselves with the snack-bar alternatives before the choice period started (= unfamiliar assortment) and the choices were made freely from the selection. In the second experiment, the participants, in turn, started to make their choices from among alternatives that they did not know beforehand (= unfamiliar assortment). However, the participants tasted the beverages a couple of days before the choice period in a blind session with six other beverage samples. Also, the participants had to make the choices under a monetary constraint. The purpose of the second experiment was to create more realistic choice situation where the choices cannot be made freely among only the most preferred alternatives (Lange et al., 1999). For the choice experiments, both the snack bar (experiment I) and beverage (experiment II) samples were chosen to represent a food category including commercial functional alternatives. Both food types were also easy to handle and preserve.

Pearson's correlation coefficient was used for investigating the associations between given ratings, background attitudes and the choices (Lawless & Heymann, 1998). The participants were also divided into three groups according to their choices (0; 1 and 2 or more choices per each alternative). The differences in the given ratings (dependent variable) between the choice groups (independent variables) were compared in Anova-models.

4. Results

4.1 Health-related claims

All the health-related claims were perceived as being either neutral or advantageous (I: Fig. 1). When a health claim was linked with a familiar health component such as probiotics, added fibre, xylitol, or low salt content, simply mentioning the health component was enough to evoke positive impressions, and increasing the strength of these claims did not automatically increase the perceived benefit.

Women perceived the health-related claims more positively than men (I: Fig. 2). The use frequency of the health components (I: Fig. 3) and the trust in different sources of food-related information (I: Fig. 5) increased the perceived advantage. The respondents who trusted functional foods and those respondents who reported frequent use of target products viewed the health claims more positively than the sceptical respondents and non-users, respectively. Although investigating the influence of personal motivation was the aim of this study, it was noted that personal motivation seemed to influence the benefit perception: women perceived the breast cancer-related claims to be more beneficial than men (I: Figure 2b).

4.2 Reasons behind functional food choices

Perceived healthiness, taste and pleasantness, convenience, price and familiarity, together with confidence, defined the reasons for choosing or not choosing the functional food alternatives (II: Fig. 4–9).

Most importantly, the reasons behind the choices were clearly product dependent, indicating that the functional foods are not a homogenous group in consumers' minds. Another important finding was that the number of choices of the functional food alternative differed according to the conventional counterpart in the choice task. In addition, the choice of a functional alternative in one category did not necessarily correlate with choosing functional products in other categories (II: Fig. 3). Based on these findings, it was concluded that the

functional food products were first considered to be a part of their primary product category (yoghurt, for instance) and then a functional alternative in that particular primary product category.

According to the hierarchical value maps, the perceived healthiness of functional foods seemed to be a multidimensional choice reason: it was linked with general well-being, prevention of disease and improved performance. Also, the health-related reasons for choices were independent of other reasons, except in yoghurt where healthiness was directly linked with taste and pleasure.

4.3 Dimensions underlying functional foods

When the dimensions were quantified (2001), 42 functional food statements formulated seven dimensions: 1) Reward from using functional foods, 2) Confidence in functional foods, 3) Necessity for functional foods, 4) Functional foods as medicine, 5) Functional foods as part of a healthy diet, 6) Absence of risk in functional foods, and 7) Taste of functional foods (III: Table 2). Perceived reward and confidence dimensions accounted for almost half (20%) of the explanation power of all dimensions (44%) (III: Table 2).

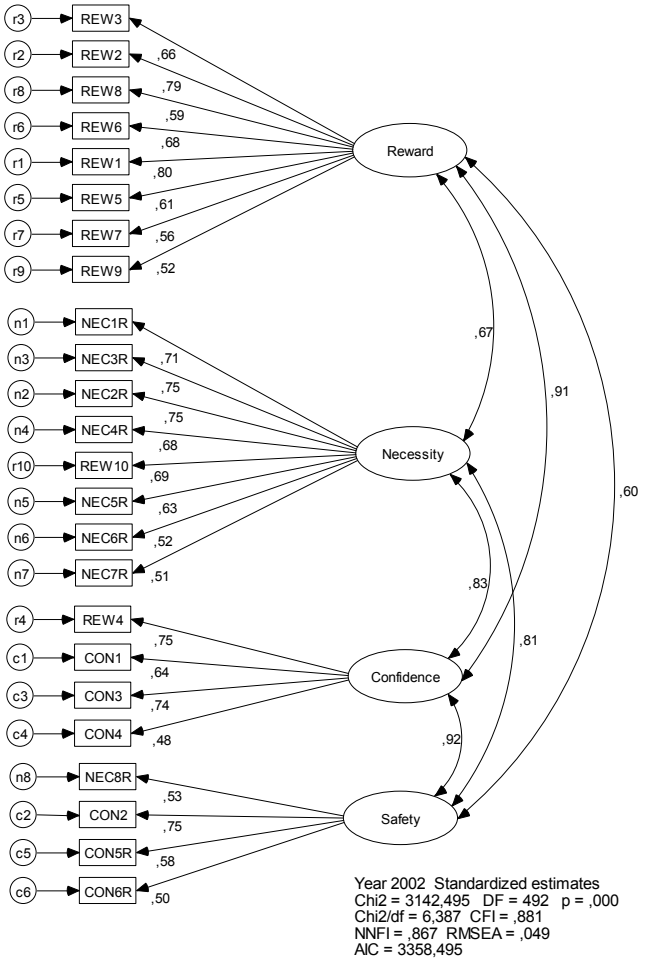
In the second survey, three (in 2002), and then 15 months later, four dimensions (in 2004) (IV: Table 3) were found. The dimensions in the last survey were: 1) Reward from using functional foods (8 items), 2) Necessity for functional foods (8 items), 3) Confidence in functional foods (4 items) and 4) Safety of functional foods (5 items). Perceived reward and necessity together covered over half (26%) of the total variance (44%) (IV: Tables 3 and 4). The scale means, standard deviations and Cronbach's alphas for the 2001, 2002 and 2004 scales are presented in Appendix 2.

The confirmatory factor analysis (Fig. 3) indicated that the factorial structure suggested in Publication IV (Appendix 3) is acceptable for describing four functional food attitudes in 2004. Indices for overall model fit were NNFI = 0.867 and CFI = 0.881 for both 2002 and 2004. In a good model, Raykov and Marcoulides (2000) suggest that they should be over 0.95. However, RMSEA = 0.049 in the present model suggesting a good model (RMSEA < 0.05) (Raykov & Marcoulides, 2000).

The interrelationships between the scales were lower in 2004 (r = 0.59–0.88) than in 2002 (r = 0.60–0.92). In particular, the high interrelationship between Confidence and Safety in 2002 (r = 0.92) indicates that they represented the same dimension (as found in 2002 EFA). In 2004, the interrelationship was lower (r = 0.70), indicating that these dimensions had diverged (Figure 3) (as found in 2004 EFA). When the extra statement was added to the questionnaire in 2004, the goodness-of fit decreased slightly (NNFI = 0.86, CFI = 0.87 and RMSEA = 0.07). However, adding the statement increased the Cronbach's alpha of the Safety-dimension from $\alpha = 0.68$ to $\alpha = 0.75$.

According to the differences between the statement means (Independent sample T-test), the attitudes towards functional foods were more positive in 2004 than in 2002. However, the real differences in the means were minor, varying between –0.2 and 0.7 on the 7-point scale (Appendix 4).

a)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Necessity
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CON4
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,74
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Confidence
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Safety
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Year 2002 Standardized estimates
Chi2 = 3142,495 DF = 492 p = ,000
Chi2/df = 6,387 CFI = ,881
NNFI = ,867 RMSEA = ,049
AIC = 3358,495

b)

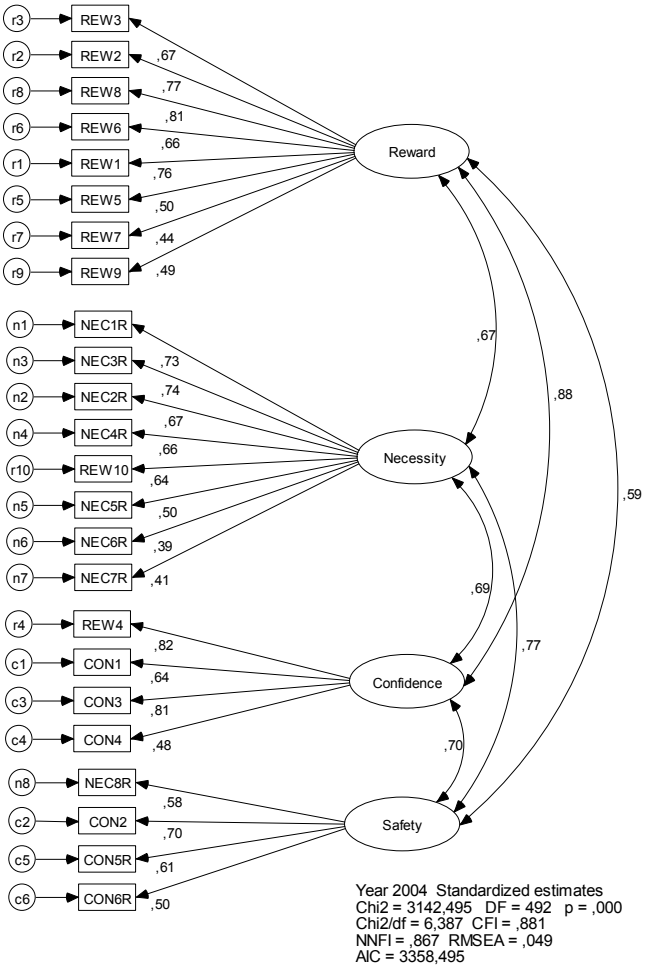

Figure 3. The confirmatory factor analysis of the functional food scales (Study IV) (a) in 2002 observed data and (b) in 2004 observed data.

The items included in the sub-scales are presented in Appendix 3, both in Finnish and in English. The main focus in the perceived reward is that health, mood and general well-being can be, in a convenient way, promoted by using functional foods. While the rewarding feeling focuses on one's own behaviour and perceptions at the personal level, the necessity is more general describing how necessary the functional foods are for society, for instance. Confidence

describes the attitudes towards confidence in the health-promoting status of functional foods and the scientific research related to them. Safety, in turn, describes the attitudes towards risks and doubts concerning the use of functional foods. To get a simpler interpretation of the attitude effects, necessity and safety scales were reversed to represent the positive attitudes towards functional foods (same direction as the reward and confidence dimensions). In this way, the possible "double negative" interpretations of their effects ("perceived needlessness reduces the willingness to use", for instance) were avoided.

Gender, age or education had practically no influence on the attitudes towards functional foods. This indicates that men and women, young and old, and people with basic and higher education perceived the functional foods similarly. However, there may be differences as to how the single functional products are accepted in these groups.

4.4 Attitudes in explaining the willingness to use functional foods

The effects of the functional food-related attitudes on the willingness to use -ratings are considered more between 2002 and 2004 (shaded area in Fig. 2) than 2001 and 2002/2004 because the factorial structure of the scales changed remarkably after 2001. In general, the influence of rewarding feeling decreased in some of the functional products. Interestingly, the general health interest became more important in the willingness to use cholesterol-lowering spread between 2002 and 2004.

The functional food-related attitudes explained the respondents' reported willingness to use the functional food examples and, though the dimensions correlated quite strongly with each other (Fig. 3; III: Table 4; IV: Table 5), they had their own product-dependent roles (III: Table 3; IV: Table 6). In general, the perceived reward from using functional foods and the necessity for functional foods explained best the reported willingness to use evaluations. Importantly, these attitudes were not predominant in various functional food products.

The general health interest (GHI; Roininen et al., 1999), natural product interest (NPI; Roininen et al., 1999) and the Food neophobia scale (FNS; Pliner &

Hobden, 1992) explained the willingness to use the reference products. GHI increased the reported willingness to use conventionally healthy food (low-fat cheese) and the NPI increased the reported willingness to use organic bread, as expected. FNS, in turn decreased the reported willingness to use functional food examples referring to general well-being. Effects of the reference scales on functional food evaluations were weaker than the effects of the attitudes towards functional foods.

4.5 Liking and perceived healthiness

Interestingly, clear differences in the hedonic ratings were found when the given hedonic ratings were compared between the participants who had not chosen the sample at all, had tried it once or had chosen it at least twice. In particular, the given hedonic scores of those participants who did not choose the product at all during the experiment were lower than those of the participants who had at least tried the product (V: Fig. 4; Fig. 7). According to Pearson's correlation coefficients, there were no remarkable associations between the perceived healthiness or background attitudes and the functional food choices (V: Table 5; Table 6). However, the choice experiments clearly showed that the hedonic liking has an overwhelming association also with the choices of functional foods.

5. Discussion

5.1 Health-related claims

The Finnish trusted the sources of food-related information, and the health-related claims were perceived as being advantageous. In general, mentioning the prevention or curing of a disease did not increase or decrease the perceived benefit of the health-related claim. This finding is in accordance with the results of Bech-Larsen and Grunert (2003) who found in a conjoint study that Finns perceived the risk-reducing claims (reduces risk of cancer and reduces risk of heart disease) to be only slightly more valuable than the general physiological claims (increases blood circulation and encourages growth of a beneficial bacteria).

From the consumers' point of view, it seems to be insignificant how aggressively the health-related information is provided. In the disease-prevention category, the personal motivation for preventing a particular disease may influence the status of the claim (van Kleef et al., 2005; Verbeke, 2005). This was true also in the present study as the women were more interested in the breast cancer-related claim than men. Consumers use different reasoning from scientific-based thinking (Lähteenmäki, 2004) and the health component, health effect and the functional product represent one unity for the consumer, unless there is contradiction between the health effect and the carrier product (Bech-Larsen & Grunert, 2003).

Although females, users of a particular health component and those who trusted the sources of food-related information were more positive towards the health-related claims compared to men, non-users and less trusting respondents, respectively, none of the groups regarded the claims as disadvantages. Women's stronger belief in health-related claims has been reported previously (Childs & Poryzees, 1998; Verbeke, 2005). However, based on the results of the present study, men did not have more negative attitudes towards functional foods.

Health benefits may be one way of differentiation and providing added value for the food products in Finland as the health-related claims were seen so positively. However, it would not be wise to believe that the health-related claims would

dominate other food choice factors such as price, hedonic pleasure or convenience. It is also likely that other manufacturers could start using the same health claims if they prove to be successful. Thus, from the manufacturers' points of view, product-specific health claims (and effects) could be a more attractive way for communicating the health effects to the consumers. In any case, careful consideration is needed because communicated links between the health effect and the component may become so self-evident that providing any new information about the component and its other possible health effects may be confusing for the consumers.

Findings also suggest that Finns react positively to health-related claims, even if they have no personal experience of the health component. This gives the manufacturers a good basis for developing new health components and presenting new applications to the markets. However, this conclusion should be considered carefully and it may not be true in other countries, as the Finnish respondents were exceptionally confident about the sources of food-related information. Finns have also been found to accept the healthiness of the functional components more readily than for instance Danes or Americans (Bech-Larsen & Grunert, 2003).

As the participants were recruited from lunch cafeterias of working places, such groups as the unemployed, parents taking care of their children at home, pensioners and students were not included into the sample. In 1999, 66% of Finnish people between 17 and 74 years were working (Statistics Finland, 2005). Hence, it is not possible to draw strong conclusions when considering the Finnish population as a whole. As different groups based on age, gender, education and living area were well presented in the sample it represented well the working population of Finns.

In the present study, the participants were simply asked to imagine the claim attached to a food product used daily. Any specific base product was not defined by the researchers, and it is not possible to conclude how the claims would affect the perceived benefits of a real functional product. However, with this design it was possible to demonstrate how the "pure" claims including different amounts and different types of information are perceived among consumers.

5.2 Reasons behind functional food choices

The dimensions behind functional food choices were found to be similar to the dimensions that have been found to be crucial in the food choice, in general (e.g. Shepherd & Sparks, 1994; Steptoe et al., 1995). Perceived healthiness, taste and pleasure, convenience, price, familiarity and confidence were the main reasons behind respondents' functional food choices. Any medicine-related associations were not found. This suggests that Finns see functional foods more as foods than medicines.

Instead of linking the confidence with the health effects in the products, the confidence in functional foods was more related to the familiarity of the brand (and manufacturer). Also, the absence of unnaturalness- and medicine-related reasons (Niva et al., 2003; Bäckström et al., 2003) was slightly surprising and refers to the confident attitude of Finns towards functional foods. One explanation could be that product cards representing commercial food products with visible brand names were used. Poulsen (1999) found that the attitudes towards actual functional products were more positive than the attitudes towards the concept of functional foods. Among Belgians, the scepticism considering functional foods has been also linked with the concept of functional foods (Verbeke, 2005). Another explanation could be that Finns trust the food-related information (I) and they simply are confident and positive towards functional foods.

Laddering interviews clearly showed that the reasons for choosing functional food products were different in different food categories. In addition, the functional food choices in one product category did not correlate with choosing a functional food alternative in other categories and the choice of a functional food alternative was dependent on the conventionally healthy counterpart. These findings suggest that consumers do not perceive functional food products as one homogenous group that could be treated as a single entity. Despite the facts that the sample was limited including mostly pensioners and students, the number of participants was small and comparing the choice frequencies of 50 respondents' does not give support for extensive conclusions (Fife-Schaw, 2002a), the idea of the heterogeneous status of functional foods clearly existed among these 50 interviewees. The surveys (III, IV) strongly supported this finding.

The laddering method is usually criticised for being challenging for both interviewees and interviewers. In particular, when the target is unfamiliar to the interviewees, as it is in the case of functional foods, it may be difficult to make spontaneous links between consequences and values (Jonas & Beckmann, 1998; Costa et al., 2004). Limitations can be minimised by using a trained interviewer and a comfortable interviewing situation (Miles & Rowe, 2004) as was done in data collection for Publication I.

Generating the statements based on the reasons for choosing within six product categories may seem partial. However, the hierarchical value maps offered different view points of functional foods and they were rich in information. The product categories represented typical functional foods available on the Finnish market in 2001, different health effects and different food categories. Naturally, it is possible that some aspects may have had less attention, as all the commercial functional food categories were not included in the study (for instance probiotic milk).

Only one person (author) categorised the product attributes, consequences and values from the interviews. Two other researchers gave their advice and suggestions in discussions. However, it would have been better to use at least two independent categorisations and then make a consensus categorisation and naming. In that case, the naming of the classes and the MECs could have been more precise. However, in the hierarchical value maps, no obvious contradictions with the interviews or earlier food choice studies were found (Roininen et al., 1999; Grunert et al., 2001, Zanoli & Naspetti, 2002).

5.3 Dimensions underlying functional foods

When the dimensions were quantified, perceived rewarding, necessity, confidence and safety were found to frame the Finns' attitudes towards functional foods. Age, gender or education did not influence the functional food attitudes. This finding concurs with the recent studies on functional foods, which have reported only weak effects of socio-demographic factors on confidence (Niva et al., 2003) and attitudes towards functional foods (de Jong et al., 2003; Verbeke, 2005).

The basis of the factorial structure describing the functional food-related attitudes was not stable during the study. Usually attitudes become more stable when the target, in this case the functional food products, become more familiar. As the target is new and unfamiliar, the perceptions may concentrate on the actual product characteristics, while the belief structures behind the attitudes, which are likely based on the product concept, remain vague (Eagly & Chaiken, 1993). This means that rapid changes in functional food markets may lead to shifting attitudes. Numerous new functional food products were launched, and also disappeared, in Finland during the study. Hence, it is highly recommended that the factorial structure of the functional food statements is checked before they are used for measuring respondents' functional food -related attitudes.

Though the samples in the surveys were targeted to represent the Finnish population, there were slightly more females and respondents with higher educational qualifications in the samples (III, IV) than in the average Finnish population (Statistics Finland, 2005). In Publication IV, there were statistically significant differences (Independent Samples T-test, Confidence level $p < 0.001$) in respondents' age and general health interest between the 2002 and 2004 data. In practise, the differences were minor (IV: Table 1).

Some insufficiency can be found in the statistical approach in the attempt to develop a tool for measuring attitudes toward functional foods. The description of the procedure has been described rather lightly in the original publications (III, IV). The confirmatory factor analysis would have been useful for checking the structures of seven subscales in 2001 (III), checking the structures of three sub-scales in 2002 and maybe also for reducing the attitude statements from 39 to 25 in 2002 (IV). To complete the analysis, the confirmatory factor analysis was carried out for this summary. In this connection, it has to be pointed out that some suspicion has been noted towards the confirmatory analysis as the result that the model agrees with the data does not imply that the model is confirmed. There are large amounts of competing models besides the "confirmed" one and testing all alternatives would not be possible (Hammond, 2002). However, in the present study, the confirmed model of the 2004 structure represented the observed data acceptably (Figure 3). Adding one item for the 2004 questionnaire increased the reliability (Cronbach's alpha). This change in Cronbach's alpha may be due to the increased number of items belonging to that scale, but the

effect of the number of the items seems to be minor in scales with over three items (Voss et al., 2000).

5.4 Attitudes in explaining willingness to use functional foods

The functional food-related attitude measurements were found to be a good tool for explaining respondents' reported willingness to use functional food products. The perceived reward from using functional foods explained clearly the reported willingness to use such food products throughout the study and the dimension remained relatively stable. The rewarding feeling described the attitudes towards one's own, personal use of functional products. Rewarding feeling can be seen as one aspect of self-efficacy (Cox et al., 2004) and personal motivation for using functional foods. Necessity was more general, describing the necessity of the functional food concept from society's point of view. Interestingly, its influence on cholesterol-lowering spread and blood pressure-lowering milk weakened as the study proceeded. Confidence was linked with trust in the health effects and also with trust in the science and studies behind functional foods.

Results indicate that the confidence and especially the safety aspects would be insignificant in functional food acceptance in Finland. This finding concurs with the results of the laddering study, where the confidence was related to the brands and neither unnatural- nor medicine-like statuses were linked with the reasons for choices (II). The apparent irrelevance of confidence and safety in willingness to use single functional foods may be true as long as the Finnish are confident about the functional foods and anything negative (for instance overdoses of nutrients) is not pointed out in general discussion. However, if something negative happens, these dormant confidence and safety aspects are likely to rise as active parts of willingness to use functional foods.

Functional food attitudes did not influence the willingness to use the conventionally healthy product (low-fat cheese). Interestingly, the necessity and confidence in functional foods weakly increased and the safety of functional foods decreased the willingness to use organic bread (IV).

The influence of general health interest in cholesterol-lowering spread evaluations became stronger as the study proceeded. Simultaneously, the influence of perceived reward and necessity weakened. This finding may indicate that the status of functional foods may be approaching the status of their conventional counterparts in Finland. In future, the general health interest may predict also the willingness to use functional foods. As food neophobia only weakly affected the interest in functional foods, the novelty of functional foods was seen differently to the novelty in foods with new sensory properties (such as ethnic foods) (III, IV).

In this study, the familiarity and the perceived healthiness (III) of the functional food examples were used only for describing the respondents. Using them as independent variables in explaining the reported willingness to use functional foods could have been interesting, but it was not the focus of the present study. Likewise, the use of functional food attitudes in explaining the reported use frequencies could provide more information on how attitudes guide the use of functional foods.

5.5 Liking and perceived healthiness

Actual liking of familiar alternatives and expected liking of unfamiliar alternatives were strongly linked with the functional food choices. There were considerable differences between the liking ratings of those participants who did not chose the particular product at all, tried it once or chose it at least twice. In particular, the liking scores of those participants who did not choose the product at all during the study were lower than those of the participants who at least tired the product. These findings concur with the results of earlier studies (e.g. Lähteenmäki & van Trijp, 1995; Arvola et al., 1999; Tuorila & Cardello, 2002; Huotilainen et al., in press), where direct sensory perception, i.e. tasting and liking, has been found to strongly guide the consumers' food choice behaviour.

In contrast, when the participants made their functional food choices in a more realistic situation, without any direct experience of the hedonic properties of the alternatives and under monetary constraint, the differences in hedonic liking (blind test) between the choice-based groups were less considerable. The differences in expected liking ratings were clearer. This means that the hedonic

expectations were strongly associated with the functional food choices. This finding concurs with the results of Tuorila & Cardello (2002) who found non-significant correlations between the blind liking ratings of juice containing a bitter compound (KCl) and the reported likelihood of its consumption and when the health-related claim was added, these informed liking ratings were strongly associated with the likelihood of consumption.

Unfortunately, the monetary constraint in the second experiment seemed to be too restrictive, forcing the participants make their choices very narrowly. Due to this limitation, the data did not allow the use of regression analysis which would have been a suitable statistical analysis method for predicting the choices with liking, perceived healthiness and background attitudes. However, the monetary constraint demonstrated the importance of the available resources in making food choices.

The choice experiments were relatively simple to carry out and were shown to be a useful tool for exploring repetitive functional food choices. In addition, to traditionally blind or expectation evaluations, choice experiments provided information on the differences in actual and expected hedonic ratings between the most and especially the least chosen alternatives and they provided an idea how the alternatives might be chosen in the real world.

Neither the general health interest, the natural product interest (Roininen et al., 1999) nor the functional food attitudes had any clear association with the choice frequencies of functional or conventional alternatives. There are several explanations for this result. Firstly, regardless of the well-distributed attitude means, the samples may still have been too small to achieve enough statistical power. Secondly, it is possible that the products did not have enough variation in those characteristics towards which the attitudes were measured. For instance, the samples may have been perceived as being so similar in their naturalness that participants' Natural Product Interest did not have any meaning in the choices. Unfortunately, any evaluations about perceived naturalness were not implemented. Thirdly, the personal relevance of the choices may have been so low that the attitudes simply had no meaning in the choices (Posavac et al., 2003).

In future, the influence of attitudes on real food choices would require greater investigation with larger consumer groups and with a wider selection of product types. Also, the level of monetary constraint has to be considered more carefully.

5.6 General limitations

Several functional food products were used in this study. Though the products either as photos, descriptions or real foods were chosen to represent different types of health effects and food categories, dairy products and drinks slightly dominated the functional food examples. However, dairy products and drinks seem to dominate also the functional food markets. In practice, the functional food examples used in this study covered the field relatively well. Of course, it is possible that there may be aspects that have been considered less, as it all commercial functional food products were not included in this study.

Throughout the study, the individuals' own health-related behaviour was focused upon. As healthiness and taking care of oneself have become a moral issue (Rozin, 1997) and people are aware that they may be evaluated by their behaviour, it is possible that the respondents may have given responses that they thought to be socially desirable (Fife-Schaw, 2002b; Haddock, 2004). It is also possible that participants have given responses that they believe are relevant to the researcher (Norenzayan & Schwartz, 1999). Emphasising that there are no right or wrong answers and that the researcher is interested in personal opinions may have helped the respondents to give less-biased answers. However, responses may have suffered from socially desirable answering as the phenomenon is not possible to avoid completely. To avoid too optimistic responses, clear options for negative responses in evaluating the advantageousness of the health-related claims, questions about the respondents' reasons behind not choosing a functional food alternative in laddering interviews and negatively worded statements in the surveys were used.

6. Conclusions

The current study has produced new knowledge on how consumers in Finland perceive functional foods and what dimensions underlie the interest in using functional food products. It also suggests a tool for explaining consumers' willingness to use functional food products. The health-related claims are clearly seen as advantages, Finnish do not have strong doubts concerning the functional foods and the health effects, the functional food are clearly seen as food (not medicine) and the strongest predictor for the acceptance of functional foods is the rewarding feeling from using functional foods. However, it has to be pointed out that the puzzle of human food choice is extremely complex and the influences of availability, price, use context and convenience cannot be overlooked.

The rewarding feeling delivered from the use of functional food products gives the manufacturers attractive possibilities to communicate the health effects of the functional foods. This study shows that there is no reason why men and the less trusting consumer groups should not be ignored in communicating targeted health effects. In fact, the health-related information should be presented in diverse ways to attract various consumer groups with different attitudes. However, personal rewarding feeling that is connected with the use of a functional food may offer the most appropriate way of communication.

The results produced strong evidence that the functional foods are not perceived as one homogenous group. The heterogeneous status of functional foods requires avoiding the use of the term *functional foods* as an umbrella term in research and in marketing communication. To obtain reliable and accurate data from consumer research, it is recommended that the primary product category is included in the possible product description. Also, if descriptions are used, they have to be clear and unambiguous for the respondents. Extrapolating the findings linked to one functional food to another has to be implemented extremely carefully.

The process for developing a tool for measuring functional food attitudes was challenging. The surveys were carried out over a period of 27 months (during 2001–2004) and during that period the changes in the Finnish functional food market were rapid. One can easily expect that the dimensions discovered in 2004

may not be expressed similarly after another three years. Functional food attitudes need further monitoring to see in what direction the status of functional foods is moving. However, it can be concluded that the functional food statements provide more a *functional food questionnaire* than a fixed attitude scale. As such, the questionnaire proved to be a practicable tool for both academic research and industry to measure attitudes underlying consumers' willingness to use functional foods.

Due to early launches of food products with health-related claims (xylitol and probiotics, for instance), the Finns are familiar with the idea of functional foods. This has given us a lead in accepting the concept of functional foods. At this stage, it seems that functional foods may loose their exceptional position in Finns' minds and the health effects may gradually become a standard option for healthiness in foods. This possible phenomenon does not mean that the functional foods would become meaningless for Finns. If anything, they may be associated as product alternatives that are considered healthier than conventionally healthy foods. It may also be risky to attach health-related claims to food products that have clear hedonic pleasure giving image. In future, this movement may come true also in other countries. However, it is extremely challenging to predict the direction the concept of functional foods will take elsewhere. There are clear cross-cultural differences especially in the confidence in functional foods and health effects. Hence, more cross-cultural research is needed to understand the consumers' perceptions towards functional food products in and outside Europe.

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Appendix 1: General description of Publications I–V

General description of the aims, respondents and methods in Publications I–V. For more detailed information, see the original Publications in Appendix 5.

Publication	Aim(s)	Method	Respondents	Measurements	
				Independent variable	Dependent variable
I	To explore how consumers in Finland perceive the health-related claims that differ in their intensity. To explore how gender, age, education, trust in the different sources of food-related information and the use frequency of health components affect the perceived advantageousness of the health-related claims.	Survey	n = 958 46% F 56% M Mean age 40 (17–81) years	Gender, age and education Use frequency of target products Trust in different sources of food-related information	Perceived advantageousness of eight health-related claims from mentioning the component to curing disease: -3 = major disadvantage 0 = neither a disadvantage nor an advantage +3 = major advantage
II	To ascertain what product attributes, consequences and higher values are given for choosing or not choosing functional food products from six product categories. To produce information for forming attitude statements that will be used in quantifying functional food-related attitudes.	Laddering-interviews	n = 50 62% F 38% M Mean age 47 (15–74) years	Reasons given for the choices between functional and conventional food examples were according to the laddering procedure.* Choice frequencies of functional and conventional food examples were recorded.	

* not a measurement

Publication	Aim(s)	Method	Respondents	Measurements Independent variable	Dependent variable
III	To quantify the dimensions underlying the attitudes towards functional foods (based on the laddering study). To find underlying dimensions that can explain reported willingness to use functional food products. To investigate how gender, age and education affect the attitudes towards functional foods. To investigate the relationships between functional food-related attitudes, general health interest, natural product interest and food neophobia.	Survey	n = 1158 58% F 42% M Mean age 44 (15–74) years The sample closely represented the Finnish population.	Agreements about 53 functional food statements on the 7-point Likert scale** Reference attitudes: General Health Interest Natural Product Interest Food Neophobia	Willingness to use functional food examples on 7-point scale: 1 = not at all willing 7 = extremely willing

** gender, age and education were used as independent variables when explaining the functional food attitudes

Publication	Aim(s)	Method	Respondents	Measurements Independent variable	Dependent variable
IV	To develop the seven attitude measurements outlined in Study III into a more feasible form. To investigate whether a shorter version of the attitude measurements can be used in explaining reported willingness to use functional food products in Finland. To explore if the factorial structure describing the functional food attitudes remains stable during the study and to monitor the possible changes over a period of 27 months. To investigate if gender, age and education affect the attitudes towards functional foods. To investigate the relationships between functional food-related attitudes, general health interest, natural product interest and food neophobia.	Two surveys	n = 1156 56% F 44% M Mean age 45 (17–78) years n = 1113 58% F 42% M Mean age 49 (18–80) years The samples closely represented the Finnish population.	Agreements about 42 and 26 functional food statements on the 7-point Likert scale** Reference attitudes: General Health Interest Natural Product Interest Food Neophobia	Willingness to use functional food examples on 7-point scale: 1 = not at all willing 7 = extremely willing

** gender, age and education were used as independent variables when explaining the functional food attitudes

Publication	Aim(s)	Method	Respondents	Measurements
V	To examine how the participants' expected and actual liking ratings are related to repeated functional food choices. To investigate how the functional food-related attitudes are related to the choices.	Two experimental choice tasks	n = 41 80% F 20% M Mean age 37 (24–59) years n = 60 70% F 30% M Mean age 35 (24–60) years	Expected liking and healthiness of example products Actual liking and perceived healthiness of example products Attitudes towards functional foods Choice frequencies of the sample products during 4 and 3 weeks***

*** choice frequencies were used as grouping variables when comparing liking and healthiness -ratings

Appendix 2: Descriptive statistics of FF-dimensions 2001, 2002 and 2004

The means, standard deviations and Cronbach's alphas (α) for dimensions describing FF attitudes in Publications III and IV.

	Publication III				**Publication IV**					
	Year	2001 n = 1158			2002 n = 1156			2004 n = 1113		
FF scale*	Abbreviation	Mean	SD	α	Mean	SD	α	Mean	SD	α
Reward from using FF	FF REW	3.4	1.2	0.89	3.6	1.1	0.88	3.7	1.1	0.85
Necessity for FF	FF NEC	4.5	1.2	0.86	4.0	1.1	0.84	4.3	0.9	0.80
Confidence in FF	FF CON	4.0	1.0	0.87	3.7	1.0	0.80	4.3	1.1	0.78
FF as a medicine	FF MED	3.6	1.1	0.68	-	-	-	-	-	-
FF as part of a healthy diet	FF PART	3.4	1.2	0.75	-	-	-	-	-	-
Safety of FF	FF SAF**	3.9	0.8	0.73	-	-	-	4.0	0.7	0.75
Taste of FF	FF TAST	3.3	1.2	0.58	-	-	-	-	-	-

*FF = **F**unctional **F**ood

**FF SAF = FF RISK in Study III.

The original Finnish items of the FF scales and their translations into English.

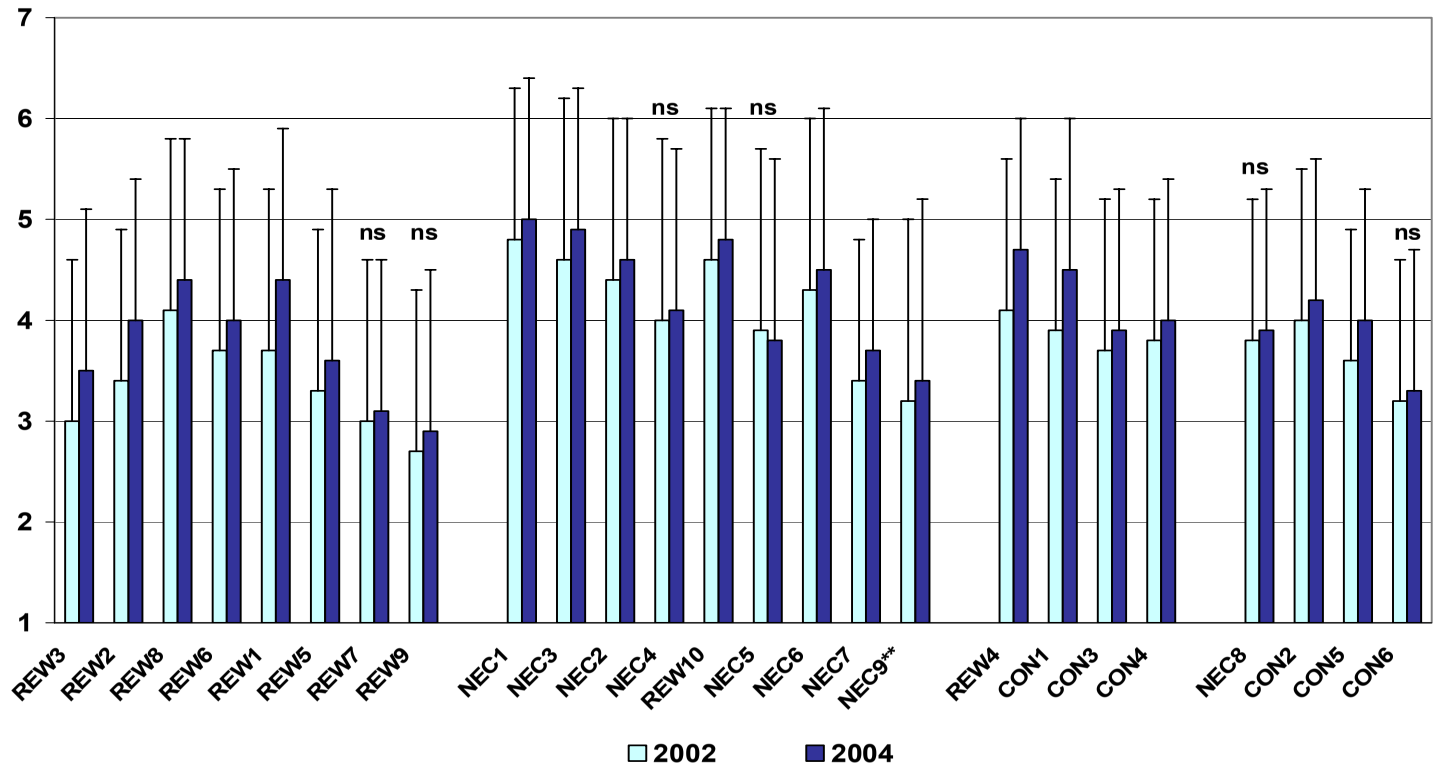
Code	Item in Finnish	Item in English
	Palkitsevuus terveysvaikutteisten elintarvikkeiden käytöstä	**Reward from using functional foods**
REW3	Voin kohentaa mielialaani käyttämällä terveysvaikutteisia elintarvikkeita.	Functional foods help to improve my mood
REW2	Suorituskykyni paranee, kun käytän terveysvaikutteisia elintarvikkeita.	My performance improves when I eat functional foods
REW8	Terveysvaikutteiset elintarvikkeet helpottavat terveellisen elämäntavan noudattamista.	Functional foods make it easier to follow a healthy lifestyle
REW6	Voin ehkäistä sairauksia syömällä säännöllisesti terveysvaikutteisia elintarvikkeita.	I can prevent disease by eating functional foods regularly
REW1	Minulle tuottaa mielihyvää ajatus siitä, että terveysvaikutteisten elintarvikkeiden avulla voin huolehtia terveydestäni.	The idea that I can take care of my health by eating functional foods gives me pleasure
REW5	Terveysvaikutteiset elintarvikkeet voivat korjata epäterveellisen ruokavalion aiheuttamat haitat.	Functional foods can repair the damage caused by an unhealthy diet
REW7	Olen valmis tinkimään elintarvikkeen mausta, jos tuote on terveysvaikutteinen.	I am prepared to compromise on the taste of a food if the product is functional
REW9	Hankin aktiivisesti tietoa terveysvaikutteisista elintarvikkeista.	I actively seek out information about functional foods

Code		Item in Finnish	Item in English
		Terveysvaikutteisten elintarvikkeiden tarpeellisuus	**Necessity for functional foods**
NEC1	R	Terveysvaikutteiset elintarvikkeet ovat täysin tarpeettomia.	Functional foods are completely unnecessary
NEC3	R	Terveysvaikutteiset elintarvikkeet ovat täydellistä huijausta.	Functional foods are a total sham
NEC2	R	Terveysvaikutteisten elintarvikkeiden yleistyminen markkinoilla on väärä kehityssuunta.	The growing number of functional foods on the market is a bad trend for the future
NEC4	R	Terveen ihmisen on hyödytöntä käyttää terveysvaikutteisia elintarvikkeita.	For a healthy person, it is worthless to use functional foods
REW10		On hienoa, että nykyteknologia mahdollistaa terveysvaikutteisten elintarvikkeiden kehittämisen.	It is great that modern technology allows the development of functional foods
NEC5	R	Haluan syödä vain sellaisia elintarvikkeita, joilla ei ole mitään lääkkeen kaltaisia vaikutuksia.	I only want to eat foods that do not have any medicine-like effects
NEC6	R	Terveysvaikutukset eivät sovi herkuttelutuotteisiin.	Health effects are not appropriate in delicacies
NEC7	R	Terveysvaikutteisia elintarvikkeita käyttävät enimmäkseen ne, jotka eivät niitä tarvitse.	Functional foods are consumed mostly by people who have no need for them
		Luottamus terveysvaikutteisiin elintarvikkeisiin	**Confidence in functional foods**
REW4		Terveysvaikutteiset elintarvikkeet edistävät hyvinvointiani.	Functional foods promote my well-being
CON1		Terveysvaikutteisten elintarvikkeiden turvallisuus on erittäin tarkasti tutkittu.	The safety of functional foods has been very thoroughly studied
CON3		Uskon, että terveysvaikutteiset elintarvikkeet täyttävät antamansa lupaukset.	I believe that functional foods fulfil their promises
CON4		Terveysvaikutteiset elintarvikkeet ovat tieteeseen perustuvia huipputuotteita.	Functional foods are science-based top products

Code		Item in Finnish	Item in English
		Terveysvaikutteisten elintarvikkeiden turvallisuus	**Safety of functional foods**
CON7	R	Liiaksi käytettynä terveysvaikutteiset elintarvikkeet voivat olla terveydelle haitallisia.	If used in excess, functional foods can be harmful to health
NEC8	R	Joissain tapauksissa terveysvaikutteiset elintarvikkeet saattavat olla haitaksi terveille ihmisille.	In some cases, functional foods may be harmful for healthy people
CON2		Terveysvaikutteisten elintarvikkeiden käyttäminen on täysin turvallista.	Using functional foods is completely safe
CON5	R	Elintarvikkeiden uudet terveysvaikutteiset ominaisuudet tuovat mukanaan ennalta arvaamattomia riskejä.	The new properties of functional foods carry unforeseen risks
CON6	R	Terveysvaikutuksista annetaan liioiteltua tietoa.	Exaggerated information is given about health effects
NEC9**	R	On järjetöntä lisätä terveysvaikutuksia muutoin epäterveellisiin ruokiin.	It is pointless to add health effects to otherwise unhealthy foods

** the item was not included in the final scales (IV) because of its poor loading on any factors

Appendix 4: FF-statement means in 2002 and 2004



The means of the functional food statements in 2002 and 2004 (1 = completely disagree, 7 = completely agree). The differences are statistically significant (Independent samples T-test, $p<0.01$) except statements marked as *ns*. Please, see original publication (IV: Table 3) for the statements behind the codes.

Appendix 5: Publications I–V of this publication are not included in the PDF version. Please order the the printed version to get the complete publication (http://www.vtt.fi/inf/pdf/)

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Series title, number and report code of publication

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Author(s)
Urala, Nina

Title

Functional foods in Finland
Consumers' views, attitudes and willingness to use

Abstract

A new category of products, so-called *functional foods* have been launched to the market in recent years. They provide a novel approach to the idea of healthy eating by linking a single component in a single product with a certain health benefit. The general aims of this study were to investigate how functional foods are perceived, what kinds of dimensions underlie and explain the acceptance of functional foods among Finns. Seven data sets involving 4536 Finnish participants were included in this study between 1999 and 2004. In general, Finns saw functional foods positively. Health-related claims were regarded as neutral or as advantages. Attitudes towards functional foods could be described by four dimensions: perceived reward from using functional foods, their perceived necessity, confidence in the promises and perceived safety. These FF-attitudes had different weight depending on the functional food product, providing strong evidence that the functional foods are not seen as a homogenous group of products. Perceived reward was the strongest factor in explaining Finns' willingness to use different types of functional foods. FF-attitudes did not differ among gender, educational- or age groups. Expected and actual hedonic liking were strongly associated with functional food choices indicating that functional foods were regarded as foods, not medicines and they have to have excellent sensory characteristics in addition to attractive health benefits.

Keywords
functional food, consumers, attitudes, health effect, acceptance, food choice, healthiness, liking

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The aim of this study was to investigate how functional foods are perceived, what kinds of dimensions underlie the acceptance of functional foods among Finns and could these dimensions be used as a tool in explaining Finns' willingness to use such foods. Seven data sets involving 4536 Finnish participants were included in this study between 1999 and 2004.

This study showed that functional foods are not seen as a homogenous group of foods. Finns were neutral or positive towards different health-related claims. Four dimensions describing the functional food-related attitudes were found: Reward from using functional foods, Necessity for functional foods, Confidence in promises of functional foods and Safety of functional foods. These attitudes had different weight depending on the functional food product. However, perceived reward was the strongest factor in explaining Finns' willingness to use different types of functional foods. FF-attitudes did not differ between genders or educational- and age groups. Roles of expected and actual hedonic liking had clear association with real functional food choices indicating that functional foods were seen more as foods than medicines and they have to have excellent sensory characteristics.

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